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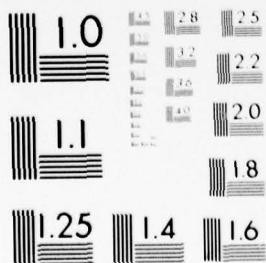
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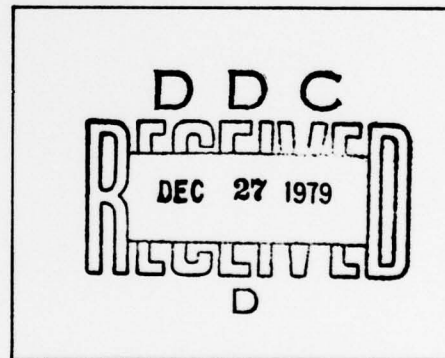
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1948



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Sandstone REPORT 41

SCIENTIFIC DIRECTOR'S REPORT OF ATOMIC WEAPON TESTS
ANNEX 17 PARTS 11 AND 141
SANDIA LABORATORY GROUP AND FORWARD AREA ADMINISTRATION



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SCIENTIFIC DIRECTOR'S REPORT
OF ATOMIC WEAPON TESTS
AT ENIWETOK, 1948

Annex 17

SANDIA LABORATORY GROUP AND FORWARD AREA ADMINISTRATION

Part II

GENERAL ORGANIZATION WITH STAFF RESPONSIBILITIES AND PLANNING
SANDIA LABORATORY GROUP - OPERATION SANDSTONE

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GENERAL ORGANIZATION
WITH
STAFF RESPONSIBILITIES
AND
PLANNING
SANDIA LABORATORY GROUP
OPERATION SANDSTONE

By
W. E. Treibel
C. H. DeSelm
R. W. Henderson

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GENERAL ORGANIZATION WITH STAFF RESPONSIBILITIES AND PLANNING
SANDIA LABORATORY GROUP - OPERATION SANDSTONE

I. INTRODUCTION

The facts and events presented here will serve as a brief summary of various activities in chronological order which are presented for the purpose of acquainting those who are interested with the necessary preparations on the part of Sandia Base personnel who were involved in Operation Sandstone. This report is not meant to be a complete historical document and will, therefore, include only those phases in which Sandia Base (Z-Division) participated. However, in order to prepare this work intelligently, it is felt that a brief outline and overlap of the entire organization is essential material and worthy of review for background.

II. HISTORY

A. Early Recommendations

The Los Alamos Scientific Laboratory had realized since late in 1946 that only through field tests and actual detonation with proper instrumentation could the experimental designs of atomic weapons be proven and thereby obtain verification of theoretical calculations. To this extent then, on April 3, 1947, the General Advisory Committee recommended that serious consideration be given a proposed test program.

Mr. Carroll L. Wilson, General Manager of the Atomic Energy Commission, prepared on April 21, 1947, a memorandum for the Commissioners in which he summarized the objectives of the Los Alamos Scientific Laboratory in requesting a field test.

B. Action of Commission

Finally after many meetings with the Commission, the Armed Forces, the Military Liaison Committee, and approval by the President, a conference was held on July 9-10 at Los Alamos Scientific Laboratory to plan a proof test program. On July 23, the Commission authorized the Los Alamos Scientific Laboratory to conduct proof tests of certain atomic weapons in the Pacific.

On August 11, 1947, the Los Alamos Scientific Laboratory agreed to undertake the direction of the technical phases of the operation. Dr. Bradbury prepared a general plan in which he outlined the measurements and observations which were considered important by the Laboratory. Emphasis was placed on the fact that assistance would be required from agencies external to the AEC and that certain phases of the over-all operation might be of technical interest to the Armed Forces.

C. Appointment of Scientific, Deputy Scientific, and Assistant Scientific Directors

Dr. Darol K. Froman, the Scientific Director, Dr. Alvin C. Graves, the Deputy Scientific Director, and Mr. R. W. Henderson, First Assistant Scientific Director, were selected by the Los Alamos Laboratory (Dr. Norris E. Bradbury) on September 18, 1947, as the men who would be responsible for the successful completion of the planned tests. A few days thereafter Dr. Froman appointed Dr. J. C. Clark as his technical staff assistant; later this designated title was changed to that of Second Assistant Scientific Director.

D. Determination of Sub-Contracting Groups

Having the basic organization thus formulated and the need of assistance already outlined to certain groups who had previously been

contacted by the Laboratory, subsequent conferences were held in Washington from late August through early November to decide on the participation of other outside agencies. These selected groups and organizations were to conduct specific experiments on which the Laboratory was interested in obtaining data.

E. Responsibilities of the Assistant Scientific Director

Dr. Froman and Dr. Graves, as the Scientific and Deputy Scientific Directors, carried the over-all responsibilities in all phases of the operation. However, their principal interests were in the scientific measurements and they, therefore, delegated to the First Assistant Scientific Director the responsibility of arranging for all the engineering work and related activities as are outlined below:

1. All ship modifications and installations
2. Construction liaison
3. Communications liaison
4. Sandia logistics
5. Bomb assembly and handling
6. Firing circuitry liaison
7. Engineering
8. Safety

These subjects will be elaborated upon by means of separate reports by the section leaders whom Mr. Henderson chose to be members of his organization.

III. PREPARATION

A. Selection of Site

A reconnaissance mission to the proposed forward areas was undertaken by Dr. Froman and Dr. Graves during the last week of October. Accompanying

them were Lieutenant General J. E. Hull, Rear Admiral F. C. Denebrink, Major General W. E. Kepner, Captain T. Hill, USN, and Captain J. S. Russell, USN, and Staff Officers. Finally after a careful study, it was decided that Eniwetok, and not Kwajalein Atoll, would be selected as the Test Site; this decision was reached on October 11, 1947. Four days later, Captain Russell, USN, was appointed as the Test Director, and as such he represented the AEC.

B. Liaison Meetings

The Test Director maintained his offices in the Division of Military Application in the Commission Building while in the United States. Joint Task Force Seven staff meetings were held twice weekly at the Pentagon Building in Washington; these meetings were attended by the Test Director, the Task Groups, members of their staffs, and the Scientific Director or his representative. In order to attend these regular semiweekly meetings, and also to keep informed on the general progress, Drs. Froman and Graves, and Mr. Henderson performed a rotating tour of duty in the Washington office every third week. In this manner the Scientific Director or his representative was always available for consultation.

Offices were also established in the Commission Building for the Scientific Director. To coordinate the planning of the experiments among all the participating organizations, i.e., Los Alamos, Naval Ordnance Laboratory, Naval Research Laboratory, Argonne National Laboratory, and Edgerton, Germeshausen, and Grier, Inc., discussions were continually being held with representatives of these agencies at this centralized office. Liaison men from all sections were constantly pursuing other groups to obtain and promulgate technical information.

C. Surveying Expedition

It was realized quite early that a Laboratory representative familiar with the general requirements was essential in the forward area. For this reason, D. J. C. Clark, representing the Scientific Director, left the United States on November 28, 1947, with Colonel D. H. Tulley and Lieutenant Colonel W. A. Stevens who represented the Army Engineers. In a short period of time the preliminary survey was completed, strategic areas were in the process of being cleared, and construction began. Dr. Clark returned to the States late in December to report conditions and progress up-to-date.

D. Los Alamos Laboratory Representatives at Eniwetok

1. Dr. J. C. Clark

Dr. Clark returned to Eniwetok on January 14, 1948, to resume his duties as representative of the advance group of TU 7.1.1. All personnel arriving prior to the Scientific Director were responsible to Dr. Clark, who communicated the Laboratory's wishes to the military services. In this manner J-Division was assured of correct interpretation of installation specifications. Dr. Clark's main function consisted of planning and liaison work at Eniwetok with the Army Engineers and the Army construction troops. All preparation for inspection parties and general progress reporting prior to the arrival of the ships rested with Dr. Clark.

All changes in specifications received from Los Alamos and Sandia were accordingly channeled by him to the construction commanders. Likewise close liaison was maintained with the offices at home. Thus, all agencies were informed of progress at the Atoll.

2. Dr. R. W. Carlson and Mr. L. M. Jercinovic

With Dr. Clark came Dr. R. W. Carlson and Mr. L. M. Jercinovic. Dr. Carlson acted as Dr. Clark's alternate, but was also charged with all matters relative to construction of the concrete structures. Mr. Jercinovic was assigned the job of construction supervisor on the 200-ft. and 75-ft. towers. Specific information concerning the duties and activities of these two men may be found in other reports.

E. Dr. Froman and Mr. Henderson's Visit to the Forward Area

During the first week of February, Dr. Froman and Mr. Henderson, with the military staff, made an inspection trip to Eniwetok Atoll to assure themselves that progress to date was satisfactory. In this short period of time, an extensive survey of the islands was completed. Several minor but pertinent last-minute changes or oversights were noted and reported to the proper authorities. With these exceptions the party returned to the States with word that the work in general was ahead of schedule and that no anticipated delays were apparent.

IV. SANDIA ORGANIZATION

Organization of J-Division at Sandia Branch of the Los Alamos Scientific Laboratory is given in Table I, which follows:

A. Formation

1. General Requirements

Inasmuch as the Assistant Scientific Director was charged with carrying out for the Laboratory all of the engineering and related problems relative to the technical phases of the operation, it was necessary to provide a group of competent engineers, specialists, and technicians who could adequately cope with the problems assigned them.

TABLE I

J-DIVISION ORGANIZATION
SANDIA BRANCH

PERSONNEL

Assistant Scientific Director

R. W. Henderson

STAFF

W. E. Treibel

C. H. DeSelm

L. M. Jercinovic

Special U.S.A.F. Liaison, Colonel J. R. Sutherland

J-7B
Technical
Photography

E.C. Udey
H.G. Sweeney
H.L. Poulsen

J-9A*
Bomb
Assembly

A.B. Machen
R.T. Bush
C.G. Kunz
R.A. Knapp
I.D. Hamilton

J-9B*
Bomb
Assembly

W.C. Bright
Neil Davis

J-10
Engineering

C.E. Runyan
W.T. Moffat
W.J. Howard
W.M. Smalley
J.O. Muench

J-11
Communications

L.A. Hopkins
Lt.Col. J.P. Scroggs

J-12*
Firing Group

W.O. McCord, Jr.
P.M. Barnes
L.D. Smith
J.J. Dawson
R.A. O'Connell
S.S. Zelinski

J-13
Construction

R.W. Carlson
L.M. Jercinovic

J-14*
Logistics

H.L. Poulsen
E.L. Brawley

J-18
Safety

Secretarial Staff

Miss Dell Johnson
J.E. Johnston, YN1, USN
G.M. Houston, YN2, USN
L.R. King, YN2, USN
A.H. Hampton, SNYN1, USN

*Indicates AFSPM Team Participation

2. Reorganization and Expansion at Sandia

It was extremely unfortunate from a psychological viewpoint for the reorganization and expansion of Sandia Base Branch of the Los Alamos Scientific Laboratory to occur when it did. Primarily personnel are interested in their own future but, while individuals are not adverse to such opportunities in field work under normal conditions, the thought of being lost in the shuffle due to proposed changes in organization gave indications of hesitation and insecurity.

The fact that experiences had been related by individuals who had returned from Operation Crossroads did not aid this situation. Mr. Henderson gave assurance to all the prospective members of J-Division who were interviewed and, later through his urging Mr. P. J. Larsen, Director of the Sandia Laboratory, presented each employee with a letter stating an equal or better position would be awaiting each individual upon his return.

3. Critique and Suggestions

One cannot help but detect anxiety on the part of personnel who are wondering whether or not the best opportunities, in the long run, remain with the home office or in the field. It is well realized that this problem is one of circumstances; criticism is not the intent. Each employee is awaiting with keen interest his placement (on the merit basis) in the enlarged organization. This fact is significant--the success of a future operation has a direct bearing on the manner in which personnel are absorbed by the Sandia Laboratory. At all times enthusiasm and eagerness to complete the task at hand were exhibited by the personnel. The ultimate arrangement for future field work, however, would be a definite permanent position outlined for each individual at Sandia prior to his departure.

B. Salary Policy

Strange as it may seem, almost all of the J-Division employees had been selected and were well into research and development work prior to the establishment of a firm personnel policy. Finally, a special financial arrangement was instituted which would compensate all University of California employees who were going to work overseas with \$200.00 per month overtime bonus pay and \$7.00 per diem while outside of the Continental Limits. Unlike Operation Crossroads, the overtime pay did not go into effect upon accepting a position in the division, but applied only for the period of time while serving outside the States. A charge of \$1.40 per day was deleted from the per diem for quarters supplied by the Government.

C. Selection of Personnel

Advantage was taken wherever possible of obtaining experienced and/or seasoned personnel who were familiar with the job at hand. Observations on the part of Mr. Henderson and other members of J-Division, who had participated in Operation Crossroads and who were aware of certain past deficiencies, supplied first-hand knowledge which served as guiding criteria in planning and eliminating shortcomings.

The majority of the personnel were recruited by Mr. Henderson himself during the months of October and November. As Z-Division Leader, he was in a good position to judge an individual's capabilities and know whether or not his personality was acceptable for the type of work to be undertaken. Some personnel volunteered their services while others were accepted on the recommendations of responsible individuals in Sandia. The phases of the work in which these groups were engaged are adequately covered in their reports.

D. Assistant Scientific Director's Staff

In order to efficiently control those phases of the operation assigned to the Assistant Scientific Director, Mr. Henderson early in October selected a staff of three (3) men from Z-Division. The primary purpose of this group was to provide guidance and liaison and to adopt certain policy and planning measures (either originating with or approved by Mr. Henderson) which were rapidly coordinated and disseminated by the staff to all personnel and related agencies. These efforts culminated in rapid progress, excellent preparation, and scheduled delivery on the part of all directed sections.

Due to the broad scope of the activities of the staff, it is impossible to enumerate by presenting a detailed chronological listing the responsibilities in which this group became involved. Most of the planning and preparation was done under Mr. Henderson's direct supervision; however, because he was not available a large portion of the time, the staff acted in his absence as his representative.

This group consisted of Messrs. DeSelm, Jercinovic, and Treibel. In the early stages of the organization all three men acquainted themselves with the general problem by studying all information available to the staff office. Far more educational, however, were the frequent trips to Los Alamos, Terminal Island, Washington, and Boston, where close contact simplified coordination and interpretation of requirements. When at Sandia, general and technical administration work was also a staff function and as time progressed, details of this type increased and eventually became a steady diet.

From the beginning it was realized that the staff would have to diversify its work; each member then became familiar with special phases of the operation.

Mr. DeSelm, in addition to performing functions for the staff, assisted Mr. Runyan in liaison work with Terminal Island Naval Shipyard in specifying alterations which had to be made to the AV-4. Other problems handled by these men were the special ramps for the LVT's 5 and 6, the design of emergency flotation equipment, and testing of certain hoists and slings. These items are all covered in detail in other reports. Mr. DeSelm also acted as Alternate Group Leader of Section J-10 (the Engineering Section) in the absence of Mr. Runyan until the Task Force arrived at Eniwetok.

Mr. Jercinovic prepared himself for the field work already mentioned and, consequently, spent a great deal of time in checking the materials delivered to Sandia against the specifications in his possession. One of the 200-ft. towers was erected at Sandia as a test run and Mr. Jercinovic followed this work very closely. Since it was planned for him to leave the States early, he devoted most of his energies to studying the proposed installations and expediting materials which were necessary in the field upon his arrival. Mr. Jercinovic's experience in procurement work proved of great value in the rapid fabrication and delivery of auxiliary equipment which was made possible through his efforts. Close liaison was maintained with Lieutenant Colonel Stevens and Los Alamos by Mr. Jercinovic with the result that all parties were familiar with scheduled requirements.

Mr. Treibel assisted Mr. Henderson by performing technical liaison work at Terminal Island, Los Alamos, Washington, and Boston. Constant surveillance and coordination were necessary to correlate the detailed requirements of all participating agencies. Up-to-date knowledge of design, pertinent details, changes, and progress regarding the installations were made known to all related groups.

Various trips were made to Dr. Froman's office at Los Alamos, and to Captain Russell's office, Naval Ordnance Laboratory, Naval Research Laboratory, the Bureau of Ships, the Pentagon to confer with the Corps of Engineers, the Staff of JTF 7, the Bureau of Yards and Docks, and other government offices in Washington. Frequent visits to Boston to consult with Edgerton, Germeshausen, and Grier, Inc., and Jackson and Moreland, contracting engineers, for information relative to the firing system and building specifications, were a necessity. To enable Mr. Henderson and Mr. Treibel to accomplish this task, a great deal of time was spent in discussing the overall problems and familiarizing themselves with the independent problems of each group.

E. Staff Functions at Sandia

All of the administrative details at Sandia were capably and efficiently managed by the staff. The routine work of administration, personnel problems, status reports, liaison with Los Alamos and subordinate sections, as well as technical problems assigned to the group itself, were aptly handled. Many of these jobs were undertaken on a coincidental rotating basis, for one or more members of the staff was always engaged in work that required his presence away from Sandia. On such occasions the individual at Sandia in the staff office accomplished the work. The members of this group had, generally speaking, trained their co-workers in such a manner that each man was familiar with the other's activities. The various secretarial and filing duties for the entire group were handled by Miss Dell Johnson, the Sandia J-Division office secretary, and Yeoman J. E. Johnston. Yeoman Johnston arrived at Sandia on January 6, 1948, from Captain Russell's office in Washington, and assisted Miss Johnson with the heavy work load. Credit is due them for their cooperative attitude and extensive work.

V. MOVEMENTS TO TERMINAL ISLAND

The Task Force was scheduled to sail from Terminal Island on March 1, with almost all of Mr. Henderson's people aboard the USS Curtiss (AV-4), which had been converted from a seaplane tender to a weapon assembly ship. By mid-February, various personnel who had been assigned special work began leaving Sandia. Mr. Henderson established his office on the AV-4, and Messrs. DeSelm, Hopkins, Howard, and others who were performing liaison were also at Terminal Island during this period.

On February 24, the bulk of Sandia personnel arrived at Terminal Island for orientation purposes. It was felt that a week's residence aboard ship before sailing would be beneficial. In this manner people would become familiar with the ship and could obtain any material, official or personal, they may have previously overlooked. Of the entire Sandia group, only two men were required in the forward area during the period from February 15 to March 15. These were Mr. L. A. Hopkins and Mr. W. T. Moffat who had communications and engineering liaison matters to investigate. Just a few days before the Task Force sailed, Mr. Jercinovic returned to the States, having completed his basic work in the field. He boarded the USS Curtiss to resume other duties. Because certain materials were not yet loaded on the USS Albemarle, Mr. Runyan remained at Terminal Island and embarked the following day on that ship. The remaining ships of Task Force Seven, the AV-4, CVE-115, and AGC-7 weighed their anchors at 1400, February 29--Eniwetok bound!

VI. STAFF FUNCTIONS ABOARD SHIP

A. Introduction

Staff functions aboard ship were handled by Messrs. Jercinovic, Treibel, and DeSelm on as equitable a basis as possible, taking into

consideration the work that each individual was familiar with and had done previous to departure from Terminal Island. Several of these assignments were handled by each man in turn so that they became familiar with the problems involved, and could act in the absence of the individual who normally had charge of the activity. Every effort was made to eliminate duplication of effort within the staff, thereby expelling confusion. The following paragraphs outline primary and collateral duties of the staff along with recommendations for use on future expeditions.

B. Primary Duties

Primary duties are here considered to be those which have an important daily effect on the functioning of the Task Unit organization. It should be noted that several photographic teams and other personnel, not part of TU 7.1.1 were quartered aboard the USS Curtiss and many of the following services were rendered to them as well as to members of Mr. Henderson's organization. These services were not rendered to the crew of the USS Curtiss, as their organization took care of these matters for them.

1. Small Boats

Small boat transportation requirements for all personnel were coordinated and forwarded to the Ship's Executive Officer for approval and action. In general, boats were dispatched on a half-hour schedule between the USS Curtiss, USS Albemarle, and the island off which the ships were anchored. The USS Albemarle operated on a similar but slightly staggered schedule, with the result that for practical purposes fifteen-minute service was available at the above points. Small boats were routed to other ships and to other islands as occasion demanded. Prior to Peter I-ray, I-ray, Yoke, and Zebra

days, a detailed boat schedule was submitted to the Test Director, Captain J. S. Russell, which covered boat requirements from noon of D minus 2 through D-day. Routine boat scheduled runs were resumed as soon as the operating areas were cleared by the Radiological Safety Groups. This activity occupied approximately one-fourth to one-third of the time of one man as the boat requests had to be carefully integrated with the operation as a whole and tactful checking had to be done with the Officer of the Deck to see that he had received the correct information and dispatched the boat on time.

2. Musters and Security Reports

While underway and at anchor, each group leader or his authorized representative made a sight muster of his men at approximately 0800 and reported this to the staff member taking the composite muster. Prior to each shot day, on D minus 1, three sight musters of all personnel were held on the main deck aft of Shop 1. These were held at 0600, 1330, and 1800 and were conducted by the muster captain for the purpose of making sure that no personnel were being inadvertently left on the Zero Island. At approximately 1830 each day the respective groups turned in a security report on their spaces. The security report was made to be sure that there were no open flames or fire hazards in the shops, that classified documents, etc., were not left adrift, that there were no water leaks, or that there were no conditions in the space which would adversely effect the safety of the ship or its occupants.

3. Restricted Data Control

At the request of Mr. H. I. Miller (TG 7.1), Restricted Data Control Officer aboard the USS Albemarle, a deputy Restricted Data Control Officer was appointed on the USS Curtiss. This was Mr. C. H. DeSelm. It was his duty to supervise the handling and distribution of all Atomic Energy

Act Restricted Data aboard the USS Curtiss and to see that proper log records, receipts, certificates of destruction, etc., were made out to reflect the movement and disposition of documents, classified memos, schedules, letters, etc. Records of classified data but not AEA Restricted Data were also kept in the same manner for J-Division personnel. Upon separation of an individual from the USS Curtiss, all AEA Restricted Data was turned in to the Control Officer for transportation back to the United States and its ultimate destination. The same was done with all classified material belonging to members of J-Division. Close liaison with Mr. Rufus W. Shivers (TG 7.1), Atomic Energy Commission Security Representative, and with Captain Karl Brecht (JTF 7, TG 7.5), J-2 Representative on the USS Curtiss, was maintained regarding the handling methods and safeguarding of this material, as well as all other security matters. All classified documents, memos, letters, etc., aboard the USS Curtiss were packaged, secured in courier boxes, and turned over to Mr. H. I. Miller prior to or upon arrival of the ships at Oakland, California.

4. Berthing and Messing Facilities

Preliminary stateroom assignments were made by Mr. C. E. Runyan at Terminal Island before the arrival of Mr. W. E. Treibel. Subsequent to this, all room assignments were made by Mr. Treibel for all personnel except the ship's crew. Army enlisted personnel of the first three grades were quartered in the CPO quarters and became members of the CPO mess. This was a decided advantage, not only from a morale and security standpoint, but from an operational standpoint, as assembly team enlisted personnel were concentrated in one location and could be easily contacted for special work. Civilians and officers were quartered in Officers Quarters and fed in the Officers Wardroom. Civilians were not allowed to join the Wardroom Mess. Mess bills averaged

about \$38.00 a month per person. Meals were considered by all to be exceptionally good as the Mess Treasurer did an excellent job.

5. Personnel Movements

Movements of civilian and military personnel were coordinated by Mr. W. E. Treibel with Mr. Armand Kelly and Major Frank Cann aboard the USS Albemarle, and AFSWP Administrative Officer aboard the USS Curtiss. The scheduling of personnel to be transported to the United States by air-lift, arrangements for orders, travel advances, clearing the ship, etc., were integrated with similar requirements on the USS Albemarle. Practically all AFSWP personnel and approximately one-third of Sandia personnel were returned to the United States from Eniwetok by air-lift.

6. VIP's

The VIP's' assignment of berthing and messing facilities, as well as the arranging of many other details for the convenience of visiting Very Important Persons, were staff functions. In this activity the staff was ably assisted by Commander R. S. Mandelkorn on X-ray shot and by Colonel J. R. Sutherland on Yoke shot. No VIP's were berthed aboard the USS Curtiss for the Zebra shot.

7. Zero Island Towers

Mr. L. M. Jercinovic spent a major portion of his time in checking the skip hoists, sheaves, cables, and affiliated equipment of the 200-ft. Zero Island towers. Much of the subsequent adjusting and maintenance work was done by him or with his aid. He also was the main hoist operator on X-ray and Yoke shots for the exacting task of hoisting the weapon to its position atop the tower.

8. Flag Office Administration

Mr. Henderson's office staff consisted of the following Yeoman assigned by CTG 7.1: J. E. Johnston, YN1, in charge; G. M. Houston, YN2; L. R. King, YN2; A. H. Hampton, YNEN.

Their primary function was to act as a stenographic pool which might be used by members of TU 7.1.1 in the preparation of memos, letters, reports, and to handle all incoming and outgoing mail and messages. To satisfy security requirements, they receipted all classified data in appropriate log books for both incoming and outgoing material. Collateral duties consisted of monitoring the MBF and Technical Net radios installed in the Flag Office, and taking action on messages as necessary, distributing personal mail, supplying messengers when needed, and, in general, maintaining a well-functioning office.

9. Roll-Up

Staff functions during roll-up started upon the departure of the first assembly team members from Eniwetok and continued until the United States was reached. Each TU 7.1.1 member had to be checked through the ship's offices wherein he might have obligations and through the Restricted Data Control Officer before leaving the ship. The process of relinquishing security control on the ship spaces was a gradual one after Zebra day and was accomplished as rapidly as packaging of classified material and report writing would permit.

C. Collateral Duties

In addition to the above primary duties many time-consuming intermittent tasks were accomplished. For the sake of brevity these are briefly outlined below. In the aggregate they accounted for a sizeable portion of the available staff members' time.

1. Meals

Meals, which by necessity had to be eaten at other than regular hours by assembly team members and those who were performing special work, were arranged for with the Wardroom Mess Treasurer and CPO Mess Caterer.

2. Keys

Keys to desks, files, and cabinets in the shop spaces were checked out by key receipts to authorized parties.

3. Local Transportation

Inter-island air-lift and local vehicle transportation were arranged as necessary.

4. Work Orders

In Mr. C. E. Runyan's absence from the ship it was a staff function to approve TU 7.1.1 requests for carpenter and machine shop work to be done by ship's personnel. Working parties were also arranged for when it was necessary to load or unload cargo and other materials.

5. Recreation

Several beach parties were organized, and with the able assistance of Colonel J. R. Sutherland, Captain J. Cushman, and Messrs. A. B. Machen and E. L. Brawley, these parties were made quite successful. Fishing parties were also formed, the participants of which either trolled or still-fished from ship's boats. Ample tackle was loaned to TU 7.1.1 members by courtesy of the ship's athletic department.

6. Money

Through the courtesy of the Commanding Officer, Captain H. R. Nieman, personal checks were cashed aboard the USS Curtiss by the Wardroom Mess Treasurer. However, it is felt that this privilege may not be extended

on future expeditions and should not be expected. Personnel should carry sufficient funds in the form of travellers checks or make arrangements at home to have Postal Money Orders forwarded to them as needed.

D. Return from Eniwetok

Several days were required for roll-up work after the last shot before it was possible to leave the Atoll. This time was spent in packaging equipment, stowing it, and general preparation on the part of all personnel, ship and laboratory, in making ready for the voyage home. On the morning of May 21, the USS Curtiss followed the USS Mt. McKinley out of the lagoon with the other ships of the convoy and arrived at Pearl Harbor early on May 27. A two-day layover with a few meetings, some business and several hours of relaxation found all hands anxious to reach the mainland. About 1000 on May 29, the same ships departed for Oakland, California, and reached their destination six days later. Almost immediately upon docking, all except a few persons whose services were required with the ship disembarked to return to their homes and families.

E. Conclusions and Recommendations

On the whole it may be said that from the staff viewpoint, Operation Sandstone was accomplished in a completely satisfactory manner. However, as an aid in planning future expeditions, the following recommendations are made:

1. Office Administration

One person in a purely administrative capacity should be included in the staff. Among this individual's duties and responsibilities would be the following:

- a. Complete responsibility for Flag Office management.
- b. Restricted Data Control.

c. Musters and security reports.

d. Personnel movements--orders, scheduling transportation, etc.

e. Miscellaneous--meal arrangements, key check-outs, etc.

The individual charged with this responsibility would require the assistance, from time to time, of another staff member or an assistant as the work load continually varies.

2. Advance Information to Ship

As early as possible in the planning phase, the Captain of the Weapon Assembly Ship should be advised of the fact that he will undoubtedly be required to supply working parties for loading and unloading of cargo and do miscellaneous carpentry and machine shop jobs. He should be advised to lay in extra stocks of materials to do the above jobs. A fund of approximately \$2,000 per month should be furnished the ship in excess of her regular allowance to pay for the above materials and for other items such as rope, cable, hardware, canvas, matting, stationery, and the like, which the scientific party cannot efficiently supply.

3. Orders

Invitational Travel Orders issued to civilians should specifically authorize them to purchase items of clothing in Navy Ships Stores and Ships Service as well as in Army Quartermaster Stores. Omission of the above item in Operation Sandstone Invitational Orders caused embarrassment to civilian personnel at both Terminal Island and Pearl Harbor Navy Stores.

4. Recreation

It is also recommended that someone be assigned the duty of Recreation Officer before leaving the United States so that he can make adequate plans for an organized recreational program for the group aboard his ship. In estimating

supplies to be provided for this purpose, an adequate margin of safety should be allowed for waste, breakage, and loss.

APPENDIX A

PHOTOGRAPHIC REPORT
ON ATOMIC WEAPON ASSEMBLY AND HANDLING
FOR X-RAY, YOKE, AND ZEBRA TESTS
AT ENIWETOK PROVING GROUNDS

by

Edwin C. Udey

PHOTOGRAPHIC REPORT

I. INTRODUCTION AND SCOPE

This report covers the photographic activities of Edwin C. Udey and Henry G. Sweeney in documenting, by means of 4 x 5 stills and 16 mm motion pictures, the assembly and handling of the atomic weapons used in X-ray, Yoke, and Zebra tests at the Eniwetok Proving Grounds.

II. BACKGROUND

This photo unit originated due to the fact that Los Alamos Security considered it inadvisable to allow the temporary photographers, hired by General Cullen for only the period of time necessary to conduct these tests, to have access to the top secret assembly operations. When this matter came up in December 1947, Mr. Henderson offered to supply photographers from his staff at Sandia Base Branch to cover his phase of the atomic tests. Soon after that Udey and Sweeney were transferred to J-Division. Arrangements were made for General Cullen's organization to supply them with all necessary photographic equipment and film, otherwise they were to operate independently from General Cullen's photo crews.

III. ACTIVITIES

A. Prior to 1 March 1948

1. Personnel

a. Edwin C. Udey was transferred from Z-1 Photo Lab, Sandia Base Branch to J-Division in December 1947.

b. Henry G. Sweeney was transferred from Z-1 Photo Lab, Sandia Base Branch to J-Division in December 1947.

2. Travel

a. Udey went to Washington, D. C., 5 January 1948, for a personal meeting with General P. T. Cullen, USAF, and his staff to formulate an operating policy and initiate an order for equipment and film.

b. Udey and Sweeney went to MacDill Field, Tampa, Florida, to meet with General Cullen and his staff 9 February 1948, regarding final equipment requirements, delivery dates, substitutions the Air Force wished to make, and to pick up one Maurer camera.

c. Udey and Sweeney went from Albuquerque to Terminal Island, arriving there 24 February 1948, and occupied quarters on the USS Curtiss until the close of the operation.

3. Equipment and Supplies

a. The meeting in Washington in January was attended by R. W. Henderson, General P. T. Cullen, Mr. Hagemeyer, Captain Robinson, and E. C. Udey. General Cullen agreed to supply Udey with everything he needed in the way of equipment and film and to keep 100% spares on equipment in reserve. Udey gave General Cullen a partial list of required equipment at that meeting.

b. A complete list of all items required by Udey and Sweeney was telephoned to General Cullen 3 February 1948, which included a consolidation of items previously requested. A copy of that list was also mailed to him on that date.

c. At MacDill Field, Florida, 9 February 1948, Udey and General Cullen went over these requirements item by item. General Cullen assured him that everything was on order, that no delays were anticipated, and that everything would be delivered to Udey at Eniwetok 15 March as per his request. This delivery date was established in order to give General Cullen as much time as

possible to procure this equipment and still leave a safety margin of several days before the assembly photography was scheduled to begin. The Air Force was unable to procure one 16mm Bell and Howell Automaster camera requested by Udey so a Filmo 70-DA (Air Force Type B-1) was substituted on the list. This action was taken after assurance from General Cullen that they had large numbers of these cameras already on hand. Udey was issued a 16mm Maurer camera at MacDill Field (Serial No. 199) and it was taken to Albuquerque for testing.

d. Plans to use 16mm Kodachrome for the assembly operations had been made; however, on 26 February at Terminal Island, it was learned from AEC Security that the Eastman Kodachrome processing plant in Los Angeles was not cleared for top secret work and it was doubtful if they would be soon. In view of this it was decided to change to black and white negative 16mm film. General Cullen was presented with this change of plans at a meeting in Captain Russell's office on the USS Albemarle that same afternoon. He immediately telephoned his supply officer in Washington cancelling the Kodachrome order, ordering 16mm black and white Super XX negative film instead.

e. Total equipment on hand, 29 February 1948: One 16mm Maurer camera without accessory case or tripod, two sets of flood lights and spot lights with extra bulbs.

B. After 1 March 1948

1. Movement Forward

a. Udey and Sweeney moved forward as passengers on the USS Curtiss arriving at Eniwetok 16 March 1948.

b. Headquarters were set up in Shop No. 11 (air conditioned) for storage of film and equipment. With the approval of J-2 representative, Captain

Karl Brecht, and Mr. R. W. Shivers of AEC Security, a file cabinet with hasp was welded to the deck of Shop No. 11 for film storage and a padlock was supplied by J-2.

c. In Pearl Harbor 7 March, Udey was assured by General Cullen that all of his equipment would be waiting for him when he arrived at Eniwetok.

2. Test Period

a. Equipment and Supplies

Upon Udey's arrival 16 March, immediate contact was made with Major Robert D. Elliott, General Cullen's representative at Eniwetok. No equipment for Udey's crew had arrived and it was impossible to obtain any information on the status of said equipment. This condition persisted until 23 March when a partial shipment arrived. This consisted of the following major items:

- 1 each Maurer 16 mm camera (Serial No. 215) complete with accessory case and tripod. (This camera was new but the mechanism was too tight to permit the use of the variable shutter and the rheostat on the 110-volt motor would not slow down to less than 32 frames per second. One complete working outfit was assembled by combining the accessory case and tripod from this camera with the camera received at MacDill Field.)
- 1 each Graphic view camera, 4 x 5 with 6-3/8- inch and 3-1/2-inch lenses in synchro shutters. (This camera was new and in good operating condition with the exception that the synchro shutters were not supplied with electric cables necessary for use with synchronized flash.)
- 2 each Speed Graphic cameras, 4 x 5. (Both of these cameras were old Air Force equipment, thoroughly beaten up and not in operating condition. On one the spring back was broken and would not hold a film pack adapter, the shutter speeds were slow, and the rangefinder was out of adjustment. The other Graphic was usable only after minor repairs had been made to the track and after it had been patched in numerous places for light leaks. Neither camera was supplied with flash extension as requested.)

1 each Tripod, No. 4 Crown. (This type of a tripod was not suitable for use on steel decks for either Graphics or view camera. It was presumably a substitute for two Quick-Set Hi-Boy tripods that were ordered because of their sturdy metal construction, telescoping, non-spreading legs, pan head, rubber feet, and exceptional height. These tripods were never received.)

1 each Tripod dolly. (This item was very satisfactory, but two had been ordered and were needed.)

4 each Weston Master exposure meters. (These meters were new and in good condition, but were not accompanied by carrying cases, which were also ordered and highly desirable for such delicate instruments.)

7 each Clamp-on Reflectors for No. 1 photoflood bulbs. (No. 1 photoflood bulbs for these reflectors were never supplied. These reflectors were substitutions on the order requesting reflectors for No. 2 photoflood bulbs and bulbs for same.)

The above items constitute the only shipment received on the original order for equipment and, as noted, in every case some items are either defective, missing, or substitutions were made with unsatisfactory replacements. No information could be obtained from anyone in the theater of operations about the status of items deleted from this shipment; however, at the close of the operation they had not been received.

Shipments of 4 x 5 film were adequate when supplemented by film from various sources in the Eniwetok area. Large quantities of 100-foot rolls of 16mm film were received early in the operation; however, no 400-foot rolls were received until 25 April, although 20 rolls were requested 10 February and more was ordered 26 February.

In the photographic plans for Sandstone, a pool of extra cameras and other equipment was to be available at the Eniwetok photographic headquarters. This reserve was to be used in case of breakdown or accidental damage to the regular equipment in use by the various photo crews. Limited facilities for

minor camera repair work were also to be maintained in this area. An effort was made to have the defective Maurer and both Speed Graphics repaired locally as they were badly needed at the time; however, no facilities for such work were available. One Graphic was repaired by Udey and Sweeney; the other was turned in for credit. At the same time another Speed Graphic outfit and a complete Maurer outfit were ordered by wire from MacDill Field and both arrived twelve days later, 11 April.

Mr. Hagemeyer sent a wire to Washington 15 April, ordering a hand-held movie camera (Filmo 70-DA) for Udey, since repeated efforts to obtain information on the one scheduled for delivery 15 March had failed. Two days later word was received that this order was being cancelled because none of these cameras was available to the Air Force in either Washington, D. C., or at MacDill Field. Mr. Hagemeyer then arranged for the transfer of a Filmo 70-DA to Udey from one of the local documentary crews.

The lack of flash bulbs and certain flash equipment constituted another bottleneck in the documentation of weapon assembly. Not one flash bulb ordered by Udey was ever received by him. On 5 April he was able to secure several cases of Wabash No. 3-B flash bulbs from a large supply received by Major Elliott. These were old Army Air Force surplus bulbs with corroded bases and averaged about 25% failures even after the bases were cleaned with emery paper. These bulbs were not the type necessary for the assembly work and arrived after most of the photography for which they were suitable had been done. In their absence it was necessary to run heavy extension power cables from the generator room to several different deck levels, and move heavy lighting units around, making slow, cumbersome set-ups for each photograph obtained. Flash extensions for each Speed Graphic, a

booster box for multiple flash and six each 50-foot extension cords were also ordered and no word concerning these items was ever received.

b. Personnel

Due to the fact that there were only two photographers and that each was operating a camera most of the time, it was necessary for them to have help in moving, setting up equipment, arranging lights, etc. Mr. Henderson arranged for Mr. H. L. Poulsen to assist the photographers, and he proved very helpful throughout the operation.

c. Photography

A total of 430 still photographs and 10,500 feet of 16mm motion pictures were taken in the Eniwetok area. Stills were taken of the X-ray assembly, movies of Yoke, while both stills and movies were taken of certain phases of the Zebra operations.

The Chief Electrician, Mr. Singer, installed casualty power outlets in Shops 1 and 2 to operate the photo lights. Power was supplied by a searchlight generator, 300 amp, 110 volt, d.c., connected to the shop outlets by means of casualty power cables. This supply was more than ample for all photographic requirements and provided the photographers with a private line so there was no danger of blowing a fuse during a critical stage of an assembly. Extensions from these two outlets supplied most of the power used for photographs in Shops 1, 2, 4, 17, and 18; ship's outlets were used in Shops 3, 5, 6, 9, and 13. Illumination was supplied by 2000-watt, Type 410 Solar Spots and Type 16 Cinelites (Mole Richardson Company), using No. 4 photoflood bulbs.

Speed Graphics were used for still photographs where movement or location demanded short exposures or portability. A 4 x 5 Graphic view

camera was used for interior work, which made it possible to compose the picture on the ground glass, to see exactly what was being included in it, and to correct for distortion to a large degree.

Maurer 16mm professional cameras were used for the majority of the movies. These were very well adapted for work in shop spaces but were too heavy and bulky for the type of work necessary on weapon handling after leaving the ship. A Bell and Howell 70-DA 16mm hand camera was used in a few inaccessible places or where rapid changing locations made use of a Maurer and tripod impossible. The use of this camera was kept to a minimum, due to its poor condition.

d. Processing and Printing

It was desired to have all the still photographs taken in the Eniwetok area processed, printed, and mounted as soon as possible for the convenience of people who were writing reports. At a meeting 11 April, attended by R. W. Henderson, W. E. Moran, R. W. Shivers, H. G. Sweeney, and E. C. Udey, an operating procedure was drafted permitting Udey and Sweeney to do this. The facilities of the Albemarle photo lab (Shop 15) in the charge of Lieut. (jg) R. L. Tomlinson were used for this purpose on the following dates: 11 April, 17 April, 29 April, 2 May, and 19 May. All of this work was done under the surveillance of the AEC security representative, R. W. Shivers, who kept a detailed record of processing and accountability for each sheet of film and paper. On these five occasions no one other than Udey, Sweeney, and Shivers had access to the photo lab. One print was made from each desirable negative. These were turned over to the Film Classification Officer, Mr. H. I. Miller, who classified them, mounted them in an album, and returned them to Mr. Henderson.

e. Film Handling and Storage

Film was handled essentially as directed by the photographic SOP for Sandstone. It was sent from the Film Control Officer, Bolling, Field, D. C., by courier shipment direct to Udey. The invoices were checked against the film received by Udey and a J-2 representative, then it was stored in a locked cabinet in Shop 11 (later moved to Shop 9). At frequent intervals J-2 made a complete inventory of all film on hand. Exposed film was also stored in this locked cabinet.

3. Post-test Period

a. Roll-up

All photographic equipment was turned over to Captain G. N. McCampbell, USAF (Supply Officer Air Task Unit 7.4.3, Special Project Supply, 16th Photo Squadron), 16 May 1948. All AEC equipment was then turned over to Berlyn Brixner, who in turn transferred the following items through Harry Allen to Sandia Base:

- 4 each Type 410 Solar Spot with stand
- 8 each Type 406 Solar Spot with stand
- 16 each Type 16 Cinelite with stand
- 8 each heavy power cable for above lights
- 2 each 16mm Maurer outfits with accessory case and tripod
- 1 each 4 x 5 Graphic view camera outfit with tripod
- 3 each Weston Master exposure meter
- 1 each dolly for Mitchell tripod

This equipment was packed, crated, and stenciled, and the roll-up completed 19 May 1948.

b. Film Disposal

Exposed film was turned over to H. I. Miller upon arrival at Oakland, California, 4 June, for subsequent shipment to Sandia Base. Tentative plans were made with the AEC Security Office in Los Angeles for the processing of all 16mm film exposed on this mission by the Consolidated Film Industries

of Los Angeles at some future date, under the supervision of Udey and Sweeney. The disposition of unexposed film had not been determined at the time this report was written.

IV. COMMENTS AND CONCLUSIONS

The arrangement whereby this photographic unit of J-Division was dependent on the Sandstone photographic organization under General Cullen for all equipment and supplies, was highly unsatisfactory for the following reasons:

A. There was no liaison between Eniwetok and the photographic supply center in the United States to permit the exchange of information regarding the shipment of supplies and equipment. Numerous items ordered were never received and no information concerning these items was volunteered or could be obtained in the Eniwetok area. These missing items did much to impair the efficiency of operation for Udey and Sweeney. Operating with a minimum of personnel, they needed every possible advantage offered by adequate equipment.

B. There was no equipment pool established at Eniwetok for the immediate exchange of faulty or damaged equipment for similar items in good condition.

C. There were no facilities available in the theater of operations for even minor camera repairs. In order to have repairs made, equipment had to be shipped to the States, with no replacement equipment available to use in the meantime.

D. All equipment that was delivered to Udey at Eniwetok arrived at a much later date than it had been promised by General Cullen.

E. Much of this equipment when received was either defective in manufacture or in a very poor state of repair. Furthermore, this equipment was shipped to Udey with no apparent effort being made to check it for serviceability, and was sent to an area where repair facilities were not available.

1063

(AIRBASE REG)
(NO 60-1)

HEADQUARTERS
ENIWETOK AIRBASE
APO 187
7 January 1948

FLYING

Air Traffic Regulations for Eniwetok Air Base

1. GENERAL

(a) Authority:

- (1) AAF Regulation 20-47 31 October 1944 Hq Army Air Forces Washington, D. C.
- (2) AAF Manual 55-2 December 1944.

(b) COMPLIANCE WITH REGULATIONS:

- (1) It is the responsibility of all pilots and personnel concerned for the enforcement of these regulations. Violations of these regulations by personnel of another command will be referred to the appropriate command for necessary action.
- (2) The Operations Officer shall supervise Airfield Operations and will be responsible for the effective control of traffic and the proper enforcement of all flying regulations in the Eniwetok Atoll Area. No attempt is made herein to describe all his duties in detail, as this matter is covered by AAF Reg 20-47 31 October 1944.

(c) CLEARANCE AUTHORITY:

- (1) The Operations Officer is assigned the duties of clearance officer for all flights made from Eniwetok Field, Eniwetok Atoll.
- (2) No flight will be made from the field until a flight plan has been filed with the Operations Officer.

2. DESCRIPTION OF FIELD:

- (a)

Elevation:	15 feet
Longitude:	162° 24' 29" East
Latitude:	11° 20' 23" North
- (b) The Radio-Telephone call assigned to the Eniwetok Control Tower is "Eniwetok Tower". The geographic position of the Tower Midway Airstrip, Oceanside.

COPY

Description of Field (Cont'd)

- (c) The Operations Building is adjacent to the Control Tower located therein are the CIC Office, Operations Office and waiting room.
- (d) The Eniwetok Island area is included within a radius of one and one-half miles from the center of the landing strip, extending to an altitude of 1500 feet.
- (e) The landing strip is a two course field. All traffic in the Eniwetok Island Area will conform to the courses shown in the diagrams attached.
- (f) The flight course in effect is indicated by radio and by the wind indicator located in front of the tower as follows:

Runway No. 6 - Land and take off on heading 64° magnetic.
Runway No. 24 - Land and take off on heading 244° magnetic.
- (g) During scheduled flying, crash equipment will be maintained at the Airfield and an ambulance will be on call.

3. AIR TRAFFIC REGULATIONS:

- (a) Air Traffic below 1500 feet within the limits of Eniwetok Island Area shall conform to the rules herein prescribed. Above 1500 feet the standard rules of the road for traffic shall apply. All air traffic around Eniwetok Island Area shall be left hand at all times. (Appendix A and B).
- (b) Aircraft shall approach the traffic pattern at an altitude of 1500 feet. Entry into the traffic pattern shall be tangent to traffic and shall be at an angle not to exceed 45° and shall be upwind of Eniwetok Tower. The minimum altitude shall be 1,000 feet with the exception of liaison type aircraft which will be 500 feet. This altitude shall be maintained until turning on the base leg. The base leg is defined as a theoretical line crossing the wind line at right angles and at least 500 yards out from the entering end of the runway. All planes shall land in the center of the runway with sufficient interval between planes to insure a safe landing. In no case will this interval be less than 2,000 feet.
- (c) During normal operations, pilots are directed to contact Eniwetok Tower when entering the Traffic pattern for directions by radio or signal lights.
- (d) "Positive Control" will be placed in effect when required by bad weather, obstruction to landing areas, or as otherwise necessary at the discretion of Eniwetok Tower. When "Positive Control" is

Motion Picture Cameras:

16mm Maurer cameras for use on a dolly in large shop areas, in semi-permanent locations, or where the time factor is not important.

16mm Kodak Cine Special camera with light tripod for operation on open decks, in landing craft, or tower operations where light weight portability is essential.

16mm Filmo Automaster camera with three-lens turret for all operations requiring a hand-held camera, combining ease of operation with rapid changing of lenses and matching viewfinders, and ease of reloading by means of magazines.

SCIENTIFIC DIRECTOR'S REPORT
OF ATOMIC WEAPON TESTS
AT ENIWETOK, 1948

Annex 17

SANDIA LABORATORY GROUP AND FORWARD AREA ADMINISTRATION

Part III

FORWARD AREA ADMINISTRATION

OPERATION SANDSTONE

FORWARD AREA ADMINISTRATION

Prepared By

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Assistant Scientific Director
Operation Sandstone

Los Alamos Scientific Laboratory

15 July 1948

FORWARD AREA ADMINISTRATION

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HISTORICAL STATEMENT

Throughout the fall of 1947 a generalized set of plans had been formulated for the use of real estate in the South Pacific as a site to conduct atomic tests, later to be known as Operation Sandstone. Of the atolls in the South Pacific which were available, Kwajalein and Eniwetok were the two for which operation plans were drawn, and of these the Laboratory favored Eniwetok over Kwajalein. Proposals along these lines were submitted to the Joint Chiefs of Staff of the Army and Navy and approval of Eniwetok was given by 15 October*. On this basis an inspection party consisting of Lt. Gen. J. E. Hull and his staff, Capt. J. Russell, Dr. Darol Froman and Dr. Alvin Graves made a trip to Kwajalein and Eniwetok on 27 - 30 October 1947. The results of this trip confirmed the previous opinion that Eniwetok was the most desirable site for the tests.

During this period, a group consisting principally of Dr. Graves, Mr. R. W. Henderson, Mr. C. A. Hedberg, and the author from Los Alamos and Lt. Col. W. A. Stevens from AFSWP** worked with the various scientific and engineering groups who were actually to conduct the scientific experiments, to ascertain construction and operation requirements and formulate a set of working drawings and plans. After several conferences with the scientific groups, a deadline of 21 November 1947 was

* JCS 1795/6

** Lt. Col. Stevens was subsequently assigned to the Joint Task Force Engineer Group under Col. D. H. Tulley.

established as the date when all the requirements for conducting each type of test should be submitted to the Laboratory. From these requirements, a so-called "final" set of working drawings was made of the island installations and a "preliminary" set of working drawings of concrete buildings was drawn by Jackson and Moreland Company, Consulting Engineers, Cambridge, Massachusetts. Drawings of the island installations, MJ3201, MJ3301 and MJ3401, were actually maps of each of the zero islands showing as nearly as possible the location of instrument houses, bomb and photo towers, tank revetments, electrical cable ditches, size and number of electrical cables, number and capacity of electrical power generators, communication requirements and, in general, as much information as was known at that time which would be required to make the installations on the islands. These maps, together with working drawings of concrete buildings and concrete tower footings furnished by Jackson and Moreland, provided Colonel Tulley's Engineer Office in Washington with the necessary information to compute amounts of material and man-hours of work required.

It should be stated that Operation Sandstone was to be executed by Joint Task Force Seven, under the command of Lt. General J. E. Hull, and that General Hull had chosen Colonel D. H. Tulley as the JTF Engineer. The actual island construction work and so-called island housekeeping would be done by the U.S. Army Engineer Corps, and the groups chosen were the 532nd Engineer Boat and Shore Regiment and a selected unit from the 18th Engineer Construction Company, under the command of Brig. General D. A. D. Ogden.

The Eniwetok Atoll was taken from the Japanese in February 1944, and occupied by our troops until sometime in 1946. During the period 1946 - November 1947, only a skeleton U.S. Naval detachment of approximately ten men under command of Ensign D. A. Ellis had been stationed there, primarily to act as guards over several warehouses full of material consigned to China, on both Eniwetok and Parry Islands. During the first part of November 1947, Major W. J. A. Hussey*, Captain H. Batz, three other officers, and 174 enlisted men from the 18th Engineer Construction Company in Hawaii were sent to Eniwetok, specifically to activate the island of Eniwetok for Operation Sandstone. This involved minor repairs to the airstrip and major repairs to existing quonset buildings to be used as quarters, offices and mess halls for approximately 2,000 men who would arrive 20 December 1947. It was necessary to establish communications directly with Hawaii, provide power, water and sewage utilities, and clean up and activate the place in general. The China material was made available for this operation along with several shiploads of supplies and equipment from Hawaii and the mainland. This activation was to be sensibly completed by 20 December 1947.

On 29 November 1947, what might be called the "survey group" went to Eniwetok. This party consisted of Col. Tulley and his Engineer officers, Lt. Col. Stevens, Lt. Col. D. Kennedy, Major Kempter, and Capt. Hoffman. In addition there were the USC and GS Survey and Triangulation group headed by Lt. Cmdr. Pfau and Mr. Heide, along with six civilian instrument men and helpers. Representing the Scientific Director of JTF 7

* Vol. 1, Annex 1, Part 1, Sec. 5, Annex 6, Rpt. to JCS by Gen. J.E. Hull.

was the author. Also in the party was Colonel L. C. Barnes, the contracting officer for the Western Ocean Division of the Corps of Engineers, who had arranged a contract with Morrison-Knudsen Company, Inc. and Peter Kiewit Sons, Inc. (known as MK-PK), to construct the 75 ft. and 200 ft. steel towers. For this job MK-PK furnished about 76 steel and concrete workers.*

Colonel Tulley's party arrived at Eniwetok on 1 December 1947. Rear Admiral F. C. Denebrink, JTF-7.3, had already arrived with several ships and was directing unloading operations of material and heavy equipment; one of these ships, the LST 45, was made available to the survey party as a hotel ship. The LST 45 was moved just offshore of Engebi Island where it anchored, and the survey party started operations at once. The preliminary survey, made first on Engebi and afterwards on Aomon-Bijiri and Runit, consisted of establishing the positions of the zero, blast and gamma lines, and the positions of the timing station, gamma buildings and blast instrument building so that they conformed as nearly as possible in positions to those shown on the island drawings MJ3201, MJ3301 and MJ3401.

The preliminary survey required about a week for each island, and by 19 December 1947 this survey was finished. The survey party then started work on a more detailed first order accuracy survey, not only of the island installations, but also a first order accuracy triangulation of the positions of all the islands and reef photo tower used in the operation.

* The three 200 ft. steel towers were purchased in 1946 by the Laboratory and were stored at Sandia. In Oct '47, the Western Ocean Division of the Engineer Corps negotiated the MK-PK contract, and Col. Barnes and a group of steel workers from MK-PK erected one tower at Sandia to make sure all parts were correctly fabricated. Although only one was erected, all three towers were checked. Part of this steel crew then went to Eniwetok with Col. Barnes.

On 5 December, Colonel Barnes* and the MKPK construction crew arrived at Engebi and started at once on the concrete footing construction for the 200 ft. steel tower. These personnel lived on the LST 45 which remained anchored off Engebi during the Engebi operations, then moved with the ship to Runit and then to Aomon. The MKPK contract involved making the concrete bases and constructing the 75 ft. photo towers and 200 ft. bomb towers on the appropriate islands, as well as constructing the 75 ft. photo tower on the coral reef in the lagoon. As the work progressed, it was possible later on for a few of the steel workers to assist the somewhat inexperienced engineer troops with rather complicated reinforcing steel rod assemblies involved in the heavily reinforced concrete instrument buildings. Also, after all the MKPK work was finished on 14 February, Colonel Tulley arranged to retain the services of two of the steel workers for the purpose of assisting the scientists in the assembly of apparatus in high and dangerous places about the towers.

On about 8 December, the LST 219 unloaded its cargo at Eniwetok Island and was moved near Runit Island to be the hotel ship for the survey party which had then moved to that island. Although the sequence for atomic disintegrations was to be Engebi, Aomon-Bijiri and Runit, the survey and early construction work progressed from Engebi to Runit and then to Aomon. This was advisable because there were 143 island natives living on Aomon and Bijiri. It was, of course, necessary to move these islanders to other real estate and Ujelang Island, approximately 160 miles southwest of Eniwetok, had been selected by the Navy as the site. The

* For details see "Report to JCS by Gen. Hull", Vol. 1, Annex 1, Part 3 Section XVI.

native chiefs were flown in a Navy PBY to Ujelang and it is reported they approved of the site, so on 20 December 1947 the natives and all of their properties were moved via LST to Ujelang. It was not until after the natives were removed from Aomon-Biljiri that any construction work was started, although the initial survey was made during the period before the natives were moved. In this regard, it should be stated that the natives objected in no way to the survey party's presence, and in fact they cooperated in several instances in assisting in boat landings and other small jobs.

On 20 December, General Ogden arrived at Eniwetok, and his 532nd Engineer Boat and Shore Regiment of forty officers, four warrant officers and 513 enlisted men arrived on 21 December. General Ogden relieved Major Hussey as atoll commander, and on 24 December Captain Batz moved the 18th Engineer Construction Company of officers and 174 enlisted men to Engebi Island, where the construction which was to be done by the Engineer Troops was started. During the third week of December, Colonel Tulley went to Hawaii and worked with the Public Works Office, 14th Naval District, to negotiate a contract with the Hawaiian Dredging Company, Ltd. to construct a causeway between the islands of Aomon and Biljiri and to construct the coral head photo tower pier* and survey tower pier** in the lagoon. The Hawaiian Dredging Company group of about 27 men arrived 25 December with two large navy barges equipped with cranes, and established working quarters

* Coral Head Photo Tower Pier:	Longitude - 162° 15' 0" E
	Latitude -- 11° 33' 0" N
** Survey Tower Pier:	Longitude - 162° 17' 10" E
	Latitude -- 11° 32' 25" N

on Biijiri Island. This work was finished by 20 March 1948, when the last of the Hawaiian Dredging Company crew departed from the atoll.

On 20 December 1947, Lt. Colonel Stevens and the author returned to the States, Colonel Stevens to the Engineers Office in Washington, and the author to Los Alamos. The return trip was made during a period of ship unloading at Engebi (steel towers, construction machinery and material), and the activation of existing quonset buildings which were to be used for quartering, motor maintenance and construction offices on Engebi.

The purpose of Lt. Colonel Stevens' return trip to the States was to get the final design drawings of the instrument buildings from Jackson and Moreland. Also, as had been anticipated, numerous changes in the planning of the instrumentation had been proposed since 21 November, and Colonel Stevens familiarized himself with all these details. In addition, Colonel Stevens and the author met with the Los Alamos liaison personnel, visited Dr. Krause, Dr. Hartmann and Mr. Grier, and briefed these people concerning the conditions which existed at Eniwetok under which they would have to work. Colonel Stevens returned to Eniwetok on 10 January 1948.

As originally planned,* the author would stay at Eniwetok long enough to accomplish the initial survey and then return to the States to assist in operations until approximately 15 March 1948, when the Laboratory ships left the ZI. However, Colonel Tulley at Eniwetok stressed the desirability of having at least one J-Division staff member present at the atoll

* As covered in LAB-W-J-5.

during the entire construction period, 10 January - 15 March 1948, and as many other J-Division personnel as the Laboratory thought desirable to assist the Engineers in getting the job done correctly. This matter was discussed with Dr. Froman, and it was decided to establish such a group in the forward area. Accordingly, on 10 January Dr. Roy Carlson, Mr. Leo Jercinovic and the author went to the atoll, and about a week later Mr. Carl Hedberg joined this group.

Dr. Carlson, a consultant, is a specialist in concrete and engineering design. Upon arriving at the atoll he made a thorough study of the coral rock and sand available for the concrete mixture and advised the Engineers on the best use of this material. In addition, he studied the structure designs and changed the "high early" cement-rock-sand proportions from those specified by Jackson and Moreland, in order not only to get a better, stronger cement, but also to reduce the curing temperature and thus minimize crack formation in the massive wall and roof structures. This was most important in the heavy concrete structures, and particularly so in the gamma structures. The services furnished by Dr. Carlson proved invaluable, and it is worth while pointing out that in future operations it is certainly advisable either to have a thorough study of the concrete specifications made beforehand, or to have such a specialist as Dr. Carlson actually present during the construction phase.

Mr. Jercinovic, an engineer from Z Division, was familiar with the 75 and 200 ft. tower designs and went to Eniwetok specifically to assist Colonel Barnes and the MKPK group in the tower construction. Mr. Hedberg, an electronic engineer from Los Alamos, had been associated with J-Division

activities during the planning stages and was thoroughly familiar with all the electrical requirements involved in the island installations. These included, in general, all electrical signal, power and communication cables, electrical generators, and special switching and control devices. The author was the J-Division staff member who served* as the J-Division liaison representative at the atoll during the period 10 January - 15 March 1948, the latter being the date the Laboratory ships arrived.

The above group of four people worked continuously with the JTF Engineers and the construction troops, and attended the weekly meetings which Colonel Tulley held with his island representatives for the purpose of expediting the work. Inter-island air and boat travel made it possible to go from one island to another in a minimum time; in fact, many times during the operation the author visited all the principal islands the same day.

During the month of January 1948, no J-Division office was set up on Eniwetok. The author's living quarters were adequate for the small amount of administrative paper work which transpired, and during this period all J-Division personnel were engaged entirely in working with the engineer construction troops on the various shot islands. However, on 1 February a central office, known as the AEC office, was established on Eniwetok, directly adjacent to the JTF Engineers' central office and nearby the Island Command Headquarters Office and message center. A soldier clerk (T/5 Schilling) was assigned to the J-Division personnel, and two combination safe file cabinets, three desks and a long map table constituted

* As covered in LAB-J-204.

the necessary furniture. This office was maintained until 1 April, that is, two weeks after the Laboratory ships arrived.

On 2 February Mr. Ray Albright, representing J-Division Property Section, arrived for permanent duty at Eniwetok. As early as this date, air shipments averaging 500 lbs. a day and consisting of scientific supplies started to arrive at Eniwetok, and a shipment of 31 vehicles (jeeps and weapon carriers) which were AEC property arrived by ship about 15 February. Soon after Mr. Albright's arrival air shipments increased, and two large quonset buildings on Eniwetok were established as AEC warehouses for storing and handling this scientific equipment. These warehouses were used for AEC property throughout the operation and during the roll-up period 16 - 30 May 1948.

During the period 1 February until the ships arrived on 15 March, the administration duties of the J-Division representatives increased steadily. Besides the continued arrival of scientific property (which was controlled by the AEC office), there were problems involving the arrival and quartering of advance scientific parties; problems involving changing plans as received in dispatches from the ZI; failure of material being installed (such as the submarine cable); lack of sufficient supplies; decisions concerning the substitution of available material; and conferences with the island command regarding evacuation of personnel during "detonation" periods. Although many of the problems which arose daily now seem unimportant, they nevertheless required immediate decisions in order to keep the general work program on schedule. The group of five permanent J-Division personnel and the AEC clerk certainly was a minimum number of

people for this job, and in future operations of this kind it is recommended that the forward area group be better organized.

GENERAL ADMINISTRATION IN FORWARD AREA

It should be understood that the purpose of the J-Division personnel in the forward area during the construction period was to act in an advisory capacity to the Army, Navy and Air Force units engaged in the construction operations and forward area planning. Therefore, the subject of forward area administration from a J-Division standpoint involved very close cooperation with the Services.

The various aspects of the forward area administration may be outlined as follows:

1. Atoll Administration
 - (a) Engineer Corps
 - (b) JTF Engineers
 - (c) J-Division Liaison
2. Communications
 - (a) To and from ZI
 - (b) Inter-island
3. Transportation
 - (a) Boat
 - (b) Air
 - (c) Land
4. Personnel
 - (a) Arrival
 - (b) Housing
 - (c) Mail
 - (d) Facilities

5. Special Problems

- (a) Roll-up Planning
- (b) AEC Property
- (c) Evacuation

6. Suggestions for Future Operations

- (a) Inter-island Communication
- (b) Central Power Plant for Test Islands
- (c) Eniwetok Headquarters
- (d) Utilities Building on Eniwetok
- (e) Liaison Planes

1. Atoll Administration

(a) Engineer Corps

Brig. General D.A.D. Ogden was the atoll commander and commander of Task Group 7.2 under General J. E. Hull. His headquarters were on Eniwetok Island and Lt. Colonel J. E. Harper, Jr. was his executive officer. In the Army Engineer organization were two groups, the 532nd Engineer Boat and Shore Regiment of 40 officers, 4 warrant officers and 513 enlisted men, and the 18th Engineer Construction Company of 4 officers and 174 enlisted men. Besides the engineers, there was at Eniwetok an Air Force detachment of approximately 10 officers and 50 enlisted men, as well as several hundred security personnel. The Air Force group was quite flexible in size, depending upon the activities at the time. This detachment was headquartered in Kwajalein, where there were over 3000 men during the peak of the operation.

The Army organization at Eniwetok was composed of the usual S-1 (Administration), S-2 (Security), S-3 (Operations), and S-4 (Supply) Sections.

The S-3 Section, headed by Lt. Colonel Salley, was responsible for all the movement of men and material between the islands and for the construction work on the islands.

(b) JTF Engineers - (c) J-Division Liaison

Colonel David H. Tulley was the JTF Engineer for the operation. He had with him a resident engineer officer at each island. Since Colonel Tulley was responsible for seeing that the construction was done according to J-Division requests, the forward area J-Division group worked directly through Colonel Tulley or his designated island engineer. They, in turn, requested the work to be done through Lt. Colonel Salley who was in charge of the troops actually doing the work. The following chart shows the names of the personnel involved in this Army organization:

ATOLL ADMINISTRATION

Eniwetok	JTF Engineer	7.2 (S-3 Section)
Atoll	Col. D.H. Tulley	Lt. Col. H.M. Salley

ISLAND ADMINISTRATION

<u>Island</u>	<u>Resident Engineer</u>	<u>Troop Commander*</u>
Engebi	Lt.Col. W.A. Stevens**	Capt. H. Batz
Aomon-Biijiri	Lt.Col. A.H. Frye	Capt. G.D. Barnette
Runit-Aniyaanii	Capt. J.A. Waits	Lt. B.A. Brim
Parry		
Photo coral head	Capt. O.W. Hoffman	Maj. R.K. Shaul
Eniwetok		

* Maj. J.D. Kelsey served as Island Commander of each of the shot islands during the period two weeks preceding each detonation.

** After the major construction was finished on Engebi, Col. Stevens was relieved for other duty and Maj. G. Kempter became Resident Engineer.

The above personnel were responsible for activating the islands and for all clearing and construction work done by the Engineer Troops on the islands. It should be remembered that the steel towers were erected by MKFK under an Engineer Corps contract, but they were responsible to Colonel Tulley in getting the job properly done. Likewise, the Hawaiian Dredging Company had a Navy contract to construct the causeway between Aomon-Biijiri as well as two coral head tower footings in the lagoon, one a small temporary footing for the 75 ft. Bilby tower used by the USC and GS survey team, and the other a permanent (estimated life ten years) steel footing for the 75 ft. photo tower. This company was responsible to Col. Tulley for getting the job properly done. The civilian personnel involved in the steel tower and tower footing construction lived both on LST's and on shore, as the requirements dictated.

2. Communications:

Commander C. L. Engleman, USN, was the JTF Communications Officer, with Mr. L. Hopkins as 7.1 (LA-J-11) representative. The over-all communications plan is adequately covered in Field Order No. 1, Annex F; but a brief discussion of forward area communication facilities prior to the arrival of the Laboratory ships will be made here.

Colonel C. H. Hatch came to Eniwetok early in December, and with a group of Signal Corps officers and men headed by Major G.F. Rogers, communications facilities were installed. This involved land lines and radio, both transmitting and receiving.

(a) Eniwetok to United States

This was a telegraphic radio link directly from Eniwetok to Hawaii. Details of these circuits and links are covered in Commander

Engleman's report. From the author's experience it was found that with this equipment it took from two to three hours for a message sent from Eniwetok to arrive at Los Alamos, so a reply presumably could be received at Eniwetok in a minimum time of from five to six hours. In order to comply with the Army routine existing on the island, all messages originating in the ISCOM-AEC office were passed to the executive officer of the island command for transmittal. When an AEC message was received at Eniwetok the message center had instructions to immediately deliver a copy directly to the AEC office. This arrangement worked perfectly. The contents of outgoing messages were never questioned by the executive officer, and this system provided a good check of AEC messages so far as the forward AEC group was concerned.

A typical message sent from Eniwetok may serve to illustrate message procedure:

Originator: ISCOM ENIWETOK

Action To: DIRECTOR LOS ALAMOS SCIENTIFIC LAB LOS ALAMOS N. M.

Security Classification: SECRET

Precedence: PRIORITY

PAREN CITE FLATCAR 300 PD FOR GRAVES FROM CLARK SIGNED OGDEN INFORMATION
SANDPIPER AND RUSSELL CITE CLARK TWENTY PAREN ITEM ONE CONFIRM MSG LAB
DASH JIG DASH TWO TWO SIX NINE ITEM TWO FROMAN ETC END

Originating Agency: ISCOM AEC

Date Time Group: 050520Z

Authorization: JAMES E. HARPER JR LT COL CE

Title: EX. OFFICER

In the above message "Cite Flatcar* 300" refers to the number of this message in the ISCOM message files. All messages sent from ISCOM Eniwetok were sent "signed Ogden", that is, General Ogden, the Island Commander, and were authorized to be sent by his Executive Officer. The "cite Clark twenty" refers to the number of the message in the AEC message series. In all AEC messages previous to 1 February 1948, the term "cite Flat _____" was used, but it was suggested that this terminology might conflict with the "Flatcar _____" system, so "cite Clark _____" was used. The first item in the message refers to confirmation of the receipt of a message number LAB-J-2269 from J-division offices at ZI. The date time group at the end of the message refers to the Greenwich (Z) time the message was filed at Eniwetok. In this date time group the first two letters (05) refer to the fifth day of the month, the next four numbers are the Greenwich or Z time the message was sent. The time table for Sandstone operation was as follows:

Eniwetok Time	Z + 12 hours
Hawaii Time	Z - 10 hours
Los Alamos Time	Z - 7 hours
Washington, D.C. Time	Z - 5 hours

*Code names involved in Operation Sandstone are Flatcar, Eniwetok Atoll; Blockhouse, Kwajalein Atoll; Sandpiper, JTF-7 Hawaii Office; Flashing, JTF-7 Washington, D.C. Office.

and as an example, the DTG 050520Z referred to in the above telegram is:

Greenwich Time	050520
Actual Eniwetok Time	051720
Actual Hawaii Time	041920
Actual Los Alamos Time	042220
Actual Washington, D.C. Time	050020

During the interval 16 January - 15 March 1948, 67 AEC messages were sent from Eniwetok, an average of about one each day. During this same period about twice as many AEC messages were received, although the incoming messages consisted in most cases of fewer words.

(b) Inter-island Communications

Early in January high frequency radio telephone and telegraph systems had been installed between Eniwetok and Engebi Islands, and as soon as the other islands were activated by troops similar systems were installed. Either desk or field type telephones were installed at important stations throughout the islands and these were wired to a central communication center on each island. The inter-island circuit was by radio and consequently no classified information could be discussed over these circuits. With this system it was possible to pick up a phone on a desk at Eniwetok and call another person at a station on any of the islands. This same system was usable for shore-ship communications, although the only ships included in the circuit were the USS Albemarle, Curtiss and Mt. McKinley. The exchanges for these phone centers were:

Eniwetok Island
Parry Island
Runit Island
Bijiri-Aomon
Engebi Island
USS Albemarle
USS Curtiss
USS Mt. McKinley

Garfield Exchange
Roosevelt Exchange
Jefferson Exchange
Polk Exchange
Lincoln Exchange
Adams Exchange
Monroe Exchange
Washington Exchange

These phones were manned on a twenty-four hour basis (the night hours were included so the atoll security control could function properly), and with very few exceptions this system worked perfectly. The exceptions arose over malfunctioning of the radio equipment, but the service was seldom discontinued for periods longer than half an hour at a time. Since the communication service was desired for the security guards up to the departure time from the shot islands, some of this equipment was lost in the detonations.

In addition to the phone service, automatic teletype units were installed on each island. These were used principally for transmitting daily news reports as received at Eniwetok. Except for purposes of morale of the troops, the inter-island teletype circuits were not really necessary for the scientific operation.

3. Transportation:

(a) Boats

The Navy task unit (7.3) provided, operated and maintained a boat pool consisting of 4 LSM's, approximately 35 LCM's and 25 LCVP's. A table showing the size, draft and other characteristics of such craft is given in Table I. Until rather late in the operation, when landing docks were built on the islands, only craft with a small draft (2' low tide and 6' high tide prevailed at Eniwetok) could satisfactorily beach.

TABLE 1

Type of Boat	LSD	LST	LSM	LST(6)	LSM(6)	LSTP	LCI	DMKW	AMTR AC
Length	458'	328'	204'	120'	56'	36'	158'	31'	20'
Width	72'	50'	34'	32'	14'	10'	23'	8'	10'
Draft	17' mod 18' aft	7' indg 11' aft	3' fwd 7' aft	2 1/2' fwd 4-2/3' aft	1 1/2' fwd 3' aft	1' fwd 2' aft	3' fwd 5' aft	3 1/2' fwd 4-1/3' aft	4 1/2'
Size of Ramp	---	15'x23' (11' ht opng)	15'x23' (11' ht opng)	14'x14'	9'x14'	5'x6'	2' ramps	---	---
Size of Cargo Space	---	Main dk 48'x120' Tank dk28' 264'x12'	20'x180' x7'	29'x28' x5'	8'x25' x6'	5'x15'x5'	comptms	7'x12'x2 1/2'	6'x14'x6'
Meas. of Ship Tons	3 Lct	2,000	700	300	50	10	150	5	8
Short Tons	1500 L.T.	Main dk390 Tank dk950	250	150	30	4 (or 3 in heavy seas)	75 for some types of ship	2 1/2	4
Safe Spd Loaded	17	11	13	8	8	9	16	5(40 mph land spd)	7(25 mph land spd)
Cruising Spd (Knots)	15	9	12	7	6	8	12	3(30 mph land spd)	6(15 mph on land)
Cruising Radius	4,000	6,000	3,500	700	400	50	2,000	50 (125 on land)	25
Fuel & Wtr Take in Gal	---	180M diesel 80M water 483M ballast	6M lubes 8M diesel 20M water 3M ballast	3400 diesel	400 diesel	120 diesel	37 ton H ₂ O 110 diesel	50 gal gas 5 water 11 pts oil	140
Total Accom	220 crew plus 200 berths	53 crew plus 160 berths-400- 700 cmbt	25 crew plus 85 berths	12 crew	85 troops not brhd	32 troops not brhd	150-200 berths	25 troops	30 troops
No. of Trucks	---	70	21	10	1 1/2	3/4 T truck	---	---	---
Misc.	---	3000 9.8D Evapora- tor	2000G.P.D. Evapora- tor	5600 as cargo	---	---	---	---	---

Although these were Navy "manned" boats, the S-3 Section of the Army dispatched and used them. The boats were used for transporting cargo and personnel between the islands and between ships berthed in the lagoon. Arrangements for obtaining a boat were made through Major Osekowski (S-3 Section) at Eniwetok. In an emergency a boat could be obtained within an hour after the request, but in general twelve hours' notice was required in order to maintain order and efficiency in dispatching the boats.

In addition to the small boats used mostly for cargo, daily inter-island schedules were established for transporting personnel and small cargo between islands. No arrangement other than being at the boat dock at departure time was necessary. The LCI's could not dock at the islands, so LCVP's met each LCI at the scheduled time and "lightered" the passengers to and from the ship and shore.

Daily LCI Service Between Islands (1 February - 15 May 1948):

LCI (A)			LCI (B)		
Lv. Eniwetok	Personnel	Dock 0745	Lv. Engebi	Personnel	Dock 0745
Lv. Runit	"	" 0930	Lv. Aomon	"	" 0845
Lv. Aomon	"	" 1015	Lv. Runit	"	" 0930
Ar. Engebi	"	" 1130	Ar. Eniwetok	"	" 1130
Lv. Engebi	"	" 1245	Lv. Eniwetok	"	" 1245
Lv. Aomon	"	" 1345	Lv. Runit	"	" 1430
Lv. Runit	"	" 1430	Lv. Aomon	"	" 1515
Ar. Eniwetok	"	" 1630	Ar. Engebi	"	" 1630

As activities on Parry Island increased, a daily boat schedule was established between Eniwetok and Parry. The travel time was twenty to twenty-five minutes and a whale boat was assigned to these runs. Two trips each morning and two trips each afternoon were found to be adequate.

(b) Air

1. C-47 Planes: A daily C-47 schedule was maintained between

Kwajalein and Eniwetok, utilizing two planes. The same planes also operated between Eniwetok and Engebi Islands until the Engebi air strip was closed to erect the messenger cables for the coax cable running to the top of the 200 ft. tower. The C-47's were equipped with bucket seats and were used for air cargo and personnel transportation. Chiefly for medical emergencies the schedules of the two planes were such* that one C-47 was at Eniwetok every night, and use was made of this arrangement several times when it became necessary to evacuate an injured or sick person to more adequate hospital facilities at Kwajalein or Hawaii. The schedules for these planes were maintained approximately as follows:

C-47 A			C-47 B
Lv. Kwajalein	0700	Monday	Same as C-47 A
Ar. Eniwetok	1000	"	Tuesday schedule
Lv. Eniwetok	1300	"	executed on Monday
Ar. Engebi	1310	"	
Lv. Engebi	1400	"	
Ar. Eniwetok	1410	"	
Stay overnight Eniwetok			
Lv. Eniwetok	1000	Tuesday	Same as C-47 A
Ar. Engebi	1010	"	Monday schedule
Lv. Engebi	1100	"	executed on Tuesday
Ar. Eniwetok	1110	"	
Lv. Eniwetok	1430	"	
Ar. Kwajalein	1700	"	
Stay overnight Kwajalein			

The C-47 planes were operated by the Air Forces** with headquarters on Kwajalein. A ground air-freight and operation crew formed a detachment of about four officers and fifty enlisted men who lived at Eniwetok.

* The schedules were changed by the ISCOM as emergencies arose.

** Air Traffic Regulations at Eniwetok are contained in Airbase Regulations No. 60-1, 7 Jan 48, Eniwetok, Annex I of this report.

2. L-4 and L-5 Liaison Planes: The 532nd Engineer Regiment brought with it two L-4 (piper cubs) and three L-5 liaison planes. It was General Ogden's plan to use these planes for inter-island transportation. The L-4 has an air speed of 60 mph and the L-5, 100 mph. Both planes carry one passenger in addition to the pilot. The L-5 is a "litter" type plane, that is, it is so designed that an injured person can be put on a stretcher and carried in the plane. An air strip 600 ft. long and 50 ft. wide is minimum yet adequate for these planes to operate at sea level. In order to use these planes, air strips were constructed on Aomon, Runit, Aniysanii and Parry Islands, and the existing strips on Eniwetok and Engebi were used. Later in the operation a strip was constructed on Biijiri Island. The strips were laid out in the direction of the prevailing winds for the first six months of the year. Construction of the strips was simple, consisting only of clearing, grading and provision of a sea water sprinkler system.

Although Air Force pilots and ground crews flew and maintained the planes, the operation of the liaison planes was under the S-3 Section of the ISCOM, with headquarters on Eniwetok, with Major Osekowski in charge of scheduling. In general these planes were used only for "priority" travel between islands. This involved carrying key personnel and packages weighing not over 200 lbs. which would fit into the planes. Special attention was always given to AEC personnel, and it should be stated that this liaison plane service was a most valuable asset during the construction phase of the operation. The USS Bairoko brought thirteen more of these planes on 15 March, providing a total of at least thirteen planes operating all the time, and during 15 March - 1 May, as many as

one hundred trips daily were made with these planes. During the period 20 January - 15 March, generally not more than three of the five planes brought by General Ogden were in operating condition, and sometimes only one. More were needed. There should have been at least ten planes on hand with eight operating. Attempts were made to get more during the construction phase, but spare parts, etc. were apparently scarce and the liaison between air and ground forces was not clarified sufficiently to get the planes and parts easily and quickly.

During the entire operation only one major accident with an L-5 occurred. The plane was damaged beyond repair but the pilot was uninjured. An early morning landing was attempted on Runit Island--into the sun--and the crash occurred. There were several minor accidents wherein propellers or a wing were damaged.

These planes fly well in moderate winds. However, during one week in February heavy winds of 40 - 60 mph, with gusts, prevailed and liaison plane operation was cancelled.*

(c) Land Transportation

The Army provided the original group of four AEC personnel with jeep transportation. Then about the middle of February, twenty jeeps and ten weapons carriers which were AEC property arrived at the atoll. These vehicles were distributed on the islands and were used almost entirely by the AEC advance parties who started arriving about this time. Later, fifteen jeeps and five weapons carriers owned by the Army were assigned to AEC

* LCVF and LCM boat schedules were also cancelled during this period, due to heavy seas in the lagoon.

personnel for their exclusive use. The final list of vehicles, available 15 March, is shown in the following table as they were assigned to the groups on that date. The group leaders were responsible for the vehicles and moved them from island to island as they wished. Exchanges with other groups were made with the approval of LAJ-14 (J-Division Property Group). The Engineer Corps maintained a motor pool on Engebi, Aomon, Runit and Eniwetok, and it was the group leader's responsibility to make sure the vehicles were properly serviced at regular intervals.

VEHICLE ASSIGNMENT

<u>Vehicle</u>	<u>Group</u>
2 Jeeps	LAJ-0 (Administration)
1 Jeep	LAJ-2
1 Jeep	LAJ-3
1 Weapons Carrier	
10 Jeeps	LAJ-4
1 Weapons Carrier	
4 WC (with generator)	
3 Jeeps	LAJ-5
1 Weapons Carrier	LAJ-7
4 Jeeps	LAJ-8
4 Weapons Carriers	
1 6x6 (with crane)	
10 Jeeps	LAJ-12
6 Weapons Carriers	
1 - 1½ ton truck	LAJ-14
1 Weapons Carrier	
3 Jeeps	LAJ-16
1 Weapons Carrier	LAJ-17
1 - 1½ ton truck	

From 15 March - 15 April, the operation could have used approximately twenty more jeeps to keep everyone well satisfied. But as fewer islands were involved, that is, after the first shot, the vehicle shortages were less pressing.

4. Personnel:

The personnel referred to here are the scientists and their assistants who participated in the tests and who were in Task Unit 7.1.1. The total number of such personnel who traveled to Eniwetok was about 120 civilian and about 130 AFSWP (military). In addition to these there were the invited guests (VIP's)* who were present only during the shots. Of the 120 7.1.1 personnel there were about 45 who went to Eniwetok prior to the arrival of the Laboratory ships for the purpose of making preparatory installation for the final instrumentation.

(a) Arrival

The schedule of arrival at Eniwetok of these personnel is as follows:

20 Jan 48	Captain F. J. Hale as NOL representative.
3 - 5 Feb 48	Dr. D. K. Froman, Mr. R. W. Henderson and Captain James Russell for conference.
4 Feb 48	M/Sgt. J. R. Ambrose from NRL for installation of lead brick coffins in timing stations.
6 - 7 Feb 48	Air Force Photo Inspection Group consisting of Colonel Kelbrere, Major Elliott, Major Conner, Lt. Kimbragh, Lt. Hearn, Lt. Ballinger, Lt. Rundell; Enlisted Men - Hayes, Allen, Gerbing, Williams, Hampton, Mitchell; Civilian - Davis. This was Mr. Davis' first trip to the site and it developed that he would be in charge of the photo tower camera instrumentation. Lt. Rundell and five enlisted men stayed on as a "movie and still" documentary photo team.

* See Chapter on Consultants and Observers in J-Division History; also Annex II of this Report.

6 - 9 Feb 48 Colonel S.L. Stewart and Lt. Colonel S. Efnor for conference on AEC property and roll-up planning.

8 - 9 Feb 48 Mr. Paul Sperling, J-16. Mr. Sperling arrived ill, and it was decided he should not stay in forward area.

15 Feb 48 NRL group to start 3" coax installation: Mr. F.I. Louckes, Mr. C. Hopkins, Mr. G.E. MacVeigh.

17 Feb 48 NRL group for coax and instrumentation. AFSWP personnel: Capt. P.D. Pavick, Capt. A.Q. Brooks, Capt. B.C. Snow; Enlisted Men - S/Sgt. L.D. Ogle, M/Sgt. J.W. Crowell, M/Sgt. W.J. Reynolds, M/Sgt. L.E. Davis, M/Sgt. C.R. Brickey, and T/4 F.G. Walling.

20 Feb 48 Electricians from Los Alamos, Mr. R.H. Mingo and Mr. J.F. Cooper, for assisting in tower motor and instrumentation generator circuit installation.

22 - 27 Feb 48 Dr. W.E. Ogle and Mr. G.A. Linenberger (LAJ-3) for inspection and raft tests.

23 Feb 48 Edgerton, Germeshausen and Grier group of six civilians and twelve AFSWP personnel: Messrs. B.J. O'Keefe, M.F. Warchol, R.H. Morris, A.K. Drake, J.D. Armstrong, Dresso; Capt. A.K. Keller, Lt. L.J. Gilbert, Lt. R.C. Nelson, Lt. W.B. Taylor; EM - T/4 O.D. Brown, M/Sgt. E.W. Bell, S/Sgt. J.V. Felker, S/Sgt. W.C. Carver, 1st Sgt. H.C. Wagner, M/Sgt. V.W. Shain, M/Sgt. A.B. McMaster and M/Sgt. A.P. Marmouget.

24 Feb 48 Mr. Carl Arndt representing Dr. F. Shonka for installing collimating tubes in gamma stations.

2 Mar 48 Mr. W.T. Moffat (LAJ-10), to assist in Engineering problems.

3 Mar 48 NRL group: Dr. C.V. Strain, Messrs. A.S. Gallia, L.A. Harris, A.P. Flanick and C.J. Zohn.

7 Mar 48 Mr. L.A. Hopkins (LAJ-11), for communications control, and Lt. Commander W.A. Rowen to assist Mr. C.A. Hedberg in wiring installations.

8 Mar 48 NOL men: Mr. P.R. Shifflett and T/Sgt. A.R. Addington.

10 Mar 48 J Div. property personnel, Mr. V.R. Benson and Capt. T. Hagler.

(b) Housing

Security control (J-2) at Hawaii kept the ISCOM advised concerning the arrival of all personnel, and the ISCOM in turn advised the AEC office

at Eniwetok. It was the policy that either Dr. Carlson, Mr. Hedberg or the author should meet each of these groups at Eniwetok airport and personally assist them in checking through the security control and take them to their temporary quarters on Eniwetok. In general, these people came to the atoll to start work at once on one of the islands. Early experience with newcomers showed that it was best to indoctrinate these people with the Army-Navy-AEC working arrangements. This could be done in a short conference. Generally, after a day at Eniwetok Island the men moved to the particular island on which they were to work.

Quarters and messing facilities on each island had previously been arranged for by conferences between the author (AEC) and Colonel Harper (ISCOM), using information from the ScOP* covering movement of the scientific personnel. Quarters on Engebi were provided for in existing quonset huts, size 20' x 40', with about 16 personnel per hut. On Aomon and Runit the Army established a tent camp, and quarters for scientific personnel were provided in regular army tents, four persons per tent. Eniwetok had plenty of quonset type barracks. Although living conditions were rather crude by the usual stateside standards, the scientific personnel apparently expected to have to "rough it", and there were no criticisms. In general, the food which the Army provided was very satisfactory. Cold beer was available. Ice cream was served at two meals each day, and every effort was made by the Army and Navy to furnish the best working relationships and conditions possible under the circumstances.

* LAB-J-273 and Annexes.

(c) Mail

A forward area post office was established at Eniwetok, APO 187. Mail arrived at Kwajalein by ATC and NATS and was brought to Eniwetok by the C-47's. Generally mail arrived once a week, each Friday, on a regularly scheduled ATC plane from Hawaii. As soon as the mail was sorted the clerk in the AEC office was furnished with the scientific personnel mail. The clerk kept a daily record of the island whereabouts of all the AEC personnel. The AEC mail was sorted as per islands and taken to the liaison plane headquarters on Eniwetok; it was then flown to the correct island for distribution. Little or no delay was encountered in getting the mail delivered after it arrived at Eniwetok, and it required from 7 to 18 days to arrive from the States.

The Army post office at Eniwetok handled stamps, parcel post, money orders and registered mail. Mail left the island daily.

(d) Other Facilities for Personnel

1. Army Post Exchange: The main post exchange was located on Eniwetok Island. In addition there were branch exchanges on Engebi, Aomon, Runit and Parry Islands*. The main exchange maintained a reasonable stock of shorts, T-shirts, handkerchiefs, towels and swimming trunks, the necessary toilet articles**, candy, tobacco, beer, Coca-Cola and soda water. Hard liquor could be purchased through the exchange officer who made the purchases at Kwajalein. Cigarettes and liquor were obtained tax free from Guam.

* The Parry Island facilities were under Navy command, with Lt. Cmdr. H.E. Rowand the Commanding Officer.

** A sunburn lotion called SKOL proved to be the most popular of the various antidotes for this purpose.

2. Officers' and Enlisted men's Clubs: Officers' and enlisted men's clubs were set up on each island. Cold beer was kept available at these clubs, and at Eniwetok the clubs were situated on a beach suitable for swimming. All AEC civilians were welcome at the officers' clubs.

3. Daily Movies: The Army and Navy maintained a daily movie schedule on each island and the principal ships. The movies were all open-air type, and except during occasional rain they were well attended, this amusement being the only one at the islands. The movies, and a few fishing and swimming gear, were under the auspices of the Army Special Services Unit. During the period 1 February - 15 March, all the "first-run" movies currently being shown in the States were shown at Eniwetok.

5. Special Problems:

(a) Roll-up Planning

As early as January 1948, the Army Engineers started planning a roll-up operation which would not only terminate the JTF-7 activities after the Zebra detonation, but would also conform with the desires of AEC so far as possible future tests were concerned. Dr. Carlson and the author were called in on several such conferences held by General Ogden at Eniwetok. At this early date no definite information was available at Eniwetok regarding intentions of the Los Alamos Laboratory or the AEC as to future tests. An assumption was made* that more tests would be performed at approximately two-year intervals, and that any such future planning should extend over a ten-year interval. On the basis of such

* During the inspection trip 2 - 5 February by Dr. Froman and party, this question was discussed further at a meeting at Eniwetok with General Hull, General McCormack and General Ogden.

assumptions, a roll-up plan was recommended by General Ogden and later approved by General Hull in Field Order No. 2 (Appendix 1 to Annex E).

In brief, the plan (so far as future AEC tests are concerned) includes:

1. Establishing a permanent "guard and maintenance" detachment of approximately 50 officers and men at Eniwetok Atoll, to be stationed on Eniwetok Island. This detachment will make regular inspections of the islands and report any irregularities, will maintain communications with Kwajalein and possibly Hawaii, and in general keep things in order at Eniwetok.

2. Razing approximately 40 quonset and other structures, considered tornado* hazards, on Eniwetok. These buildings were rather arbitrarily selected by an inspection party consisting of General Ogden, Lt. Colonel Salley and the author. These buildings are indicated on the map of Eniwetok contained in Field Order No. 2, Appendix 1 to Annex E.

3. Securing approximately 130 buildings on Eniwetok considered in good enough condition to be used for future test operations. Many of these buildings are to be painted, doors and windows repaired, etc. These buildings are indicated on the map referred to above.

(b) AEC Property

In addition to the above island installation roll-up planning, conferences were held with Colonel S. L. Stewart and Colonel S. Efnor during their visit to Eniwetok, concerning suitable disposition of AEC property in the roll-up operation. It was tentatively decided in these meetings that all AEC automotive equipment, electronic gear, special apparatus, etc. should be returned to the States and disposed of in an

* Eniwetok Atoll is not in the typhoon region, but there have been 60 - 75 mile gales recorded.

approved manner. However, it was decided to leave the two unused 75 ft. photo towers, approximately 56 reels of unused submarine cable*, 300 boxes** of lead bricks and a few miscellaneous items in warehouses E and G on Eniwetok; also all of the lead bricks used in the lead coffins were to be left in the timing stations on Engebi, Biijiri and Runit Islands. The above recommendations eventually were incorporated in the final roll-up plan.

(c) Island Evacuation Plan

Early in February, the Army Engineers carried on conferences with forward area AEC personnel to formulate a plan for the evacuation of the personnel quartered on the islands in the atoll during the period one day previous to one day after an atomic detonation. Actually, final discussions on an evacuation plan were not reached until after 15 March, when the Task Force headquarters were at the atoll. However, for the record, it is pointed out here that AEC representatives in the forward area were called upon by the Island Command to assist in formulating plans for operations which were somewhat foreign in nature to the Army personnel. Such requests for advice were made of AEC personnel many times during the period before 15 March.

* In addition to 26 - 5000 ft. reels of 10-conductor submarine cable in warehouse G on Eniwetok, there is a coil of about 60,000 ft. of this cable on the ground, covered with sand, very near the boat landing dock at Parry Island. This is discussed in Commander Rowand's report on submarine cable laying. In addition, there are 30 reels of 3-conductor submarine cable in warehouse G.

** Each box containing 36 bricks, 2" x 4" x 8", and weighing nearly 1000 lbs.

6. Suggestions for Future Operations:

In general, the forward area J-Division representatives had relatively few major administrative problems to handle. The engineering and scientific questions which developed during the construction phase were of a nature which could either be answered at once or the answer obtained by radio from the ZI in a short enough time so that construction was not impeded. Included in the forward area AEC group should have been an experienced office clerk and a senior property representative. In any case there should be no rotation of the personnel who go to the forward area for the operation, with the possible exception of engineers or consultants who are involved in one phase of the operation only.

Any suggestions which are made depend largely upon the organization of future operations. It is believed that, provided there is sufficient time for planning the next operation, all construction could best be done by a private contracting firm rather than by importing a large number of troops. Assuming another test program is to be accomplished in March and April two years hence, using the same three shot islands, the following construction program should be initiated at once with a completion date of at least six months before the test dates:

(a) Inter-island Communications

1. Build a small bomb-proof communication shelter at the extreme southern end of Engebi, Rojoa and Runit. This shelter would house the island telephone exchange and an emergency single-channel two-way radio telephone set.*

* Based on the assumption that all scientific personnel will live ashore. If hotel ships are used, then a more elaborate ship-shore radio link must be provided.

2. Lay a 20-conductor (communication type) submarine cable from the communication shelters on Engebi, Rojoa, Runit, Parry and Eniwetok.

With this partly-permanent installation, the major inter-island communication problem is solved for the next ten years. The office and instrument station phones on each shot island would be temporarily wired in for the duration of the test period, and the temporary wiring of course destroyed during each test.

3. In addition to the land phones installed in offices and instrument stations throughout the islands, it is suggested that a large size loud speaker or two be installed on a pole at the center of each island for the purpose of calling personnel to the phone. This public address system would be operated from the communications center for each island. Considerable time and effort was lost during Operation Sandstone by inability to locate individuals readily.

(b) Central Power Plant for Test Islands

During Operation Sandstone individual diesel electric generators were installed nearby the zero and photo towers and the instrument station on each island, and these were destroyed during the detonations. It is believed--although the economics have not been investigated--that a more satisfactory solution to this problem is to erect a bombproof building on Aniyaanii Island and install in this building three diesel generator units, any one of which is large enough to carry the total load. Power from these generators would be transmitted by an overhead transmission line to the places on the island where it would be used. The transmission voltage would probably have to be 13 KV or even higher.

The advantage this arrangement offers is not only that the generators are usable for the next ten years, but the problem of generator operation is simplified over that involved in Operation Sandstone. If the transmission line is reasonably well built, it is believed that only minor repairs will be necessary at the beginning of each test period, that is, every two years. It is believed that most, if not all, of this transmission line can be overhead construction.

(c) Eniwetok Headquarters

It is believed that an AEC headquarters building should be constructed on Eniwetok. This building should be of concrete block construction and planned for a minimum lifetime of ten years. It should consist of the following units:

1. Communications center

a. Central inter-island telephone

b. Eniwetok - Kwajalein - Hawaii radio sets

2. AEC Headquarters Office

a. AEC Security Office (for film and documents)

3. Photographic laboratory

4. Mess hall for _____ scientists.

5. Living quarters for _____ scientists.

(d) Utilities Building on Eniwetok

It is believed that a central utilities building should be constructed on Eniwetok. This building should be built on a ten-year minimum lifetime basis, and if properly planned most of the machinery can be located in one room and thus maintained by one or two operators per shift.

It should have the following permanent equipment:

1. Electrical power plant
 - a. One large generator for test period load.
 - b. One or two small generators for inter-test period loads.
2. Refrigerator unit
 - a. Large reefer room and reefer unit for test period load.
 - b. Small reefer room and unit for inter-test period load.
3. Ice and ice-cream making facilities suitable for the test period load.
4. Distillation Plant

It is believed that by providing suitable storage tanks and drainage systems to buildings with large roof areas, sufficient rain water can be conserved to furnish all inter-test and part of the test period demands. However, during test periods, or unforeseen droughts, a medium capacity distillation plant should be provided.

5. Laundry Facilities

Normal laundry facilities should be provided for the test period requirements.

(e) Liaison Planes

It is believed that liaison planes of the "Beechcraft Bonanza" or "Piper Cub" class should be provided for inter-island travel, except where small boats must be used. At least a dozen such planes should be available during most of the construction phase of the operation.

1063

(AIRBASE REG)
(NO 60-1)

HEADQUARTERS
ENIWETOK AIRBASE
APO 187
7 January 1948

FLYING

Air Traffic Regulations for Eniwetok Air Base

1. GENERAL

(a) Authority:

- (1) AAF Regulation 20-47 31 October 1944 Hq Army Air Forces Washington, D. C.
- (2) AAF Manual 55-2 December 1944.

(b) COMPLIANCE WITH REGULATIONS:

- (1) It is the responsibility of all pilots and personnel concerned for the enforcement of these regulations. Violations of these regulations by personnel of another command will be referred to the appropriate command for necessary action.
- (2) The Operations Officer shall supervise Airfield Operations and will be responsible for the effective control of traffic and the proper enforcement of all flying regulations in the Eniwetok Atoll Area. No attempt is made herein to describe all his duties in detail, as this matter is covered by AAF Reg 20-47 31 October 1944.

(c) CLEARANCE AUTHORITY:

- (1) The Operations Officer is assigned the duties of clearance officer for all flights made from Eniwetok Field, Eniwetok Atoll.
- (2) No flight will be made from the field until a flight plan has been filed with the Operations Officer.

2. DESCRIPTION OF FIELD:

- | | | |
|-----|------------|-------------------|
| (a) | Elevation: | 15 feet |
| | Longitude: | 162° 24' 29" East |
| | Latitude: | 11° 20' 23" North |

- (b) The Radio-Telephone call assigned to the Eniwetok Control Tower is "Eniwetok Tower". The geographic position of the Tower Midway Airstrip, Oceanside.

Description of Field (Cont'd)

- (c) The Operations Building is adjacent to the Control Tower located therein are the CIC Office, Operations Office and waiting room.
- (d) The Eniwetok Island area is included within a radius of one and one-half miles from the center of the landing strip, extending to an altitude of 1500 feet.
- (e) The landing strip is a two course field. All traffic in the Eniwetok Island Area will conform to the courses shown in the diagrams attached.
- (f) The flight course in effect is indicated by radio and by the wind indicator located in front of the tower as follows:

Runway No. 6 - Land and take off on heading 64° magnetic.
Runway No. 24 - Land and take off on heading 244° magnetic.
- (g) During scheduled flying, crash equipment will be maintained at the Airfield and an ambulance will be on call.

3. AIR TRAFFIC REGULATIONS:

- (a) Air Traffic below 1500 feet within the limits of Eniwetok Island Area shall conform to the rules herein prescribed. Above 1500 feet the standard rules of the road for traffic shall apply. All air traffic around Eniwetok Island Area shall be left hand at all times. (Appendix A and B).
- (b) Aircraft shall approach the traffic pattern at an altitude of 1500 feet. Entry into the traffic pattern shall be tangent to traffic and shall be at an angle not to exceed 45° and shall be upwind of Eniwetok Tower. The minimum altitude shall be 1,000 feet with the exception of liaison type aircraft which will be 500 feet. This altitude shall be maintained until turning on the base leg. The base leg is defined as a theoretical line crossing the wind line at right angles and at least 500 yards out from the entering end of the runway. All planes shall land in the center of the runway with sufficient interval between planes to insure a safe landing. In no case will this interval be less than 2,000 feet.
- (c) During normal operations, pilots are directed to contact Eniwetok Tower when entering the Traffic pattern for directions by radio or signal lights.
- (d) "Positive Control" will be placed in effect when required by bad weather, obstruction to landing areas, or as otherwise necessary at the discretion of Eniwetok Tower. When "Positive Control" is

Air Traffic Regulations (Cont'd)

in effect, all aircraft shall be prepared to take instructions by voice radio from the control tower and also traffic control light signals.

- (e) Traffic Signal Lights to planes approaching for a landing are as follows:

Red Light.....Do not land, circle field.

Green Light.....Proceed to landing.

Alternate Green and Red Light.....General warning signal, pilot to be on alert for hazardous or unusual condition. (Local regulation).

- (f) While operating on Runway No. 6 and No. 24 following take off, aircraft shall maintain a straight course in line with the airstrip until a minimum altitude of 500 feet is reached at which time the aircraft shall commence a turn to the right to leave traffic. See Appendix A and B.

- (g) Formation take-offs are not allowed. No Plane will take off until the preceding plane has cleared the end of the runway.

- (h) No acrobatics will be performed over Eniwetok Island. All acrobatics will be executed over water and all recoveries must be at a minimum altitude of 1500 feet.

4. TAXIING INSTRUCTIONS:

- (a) All planes taxiing will be under the direction of the Eniwetok Control Tower.

- (b) Transient aircraft require the assistance of a "Follow-Me" jeep for taxiing.

- (c) Traffic signal lights to planes on the ground are:

Red light.....Do not take-off, stop where you are.

Hold your position.

Green light.....Clear to take off or taxi.

Flashing red.....Return to line.

- (d) Visual light signals contained herein are authorized by Commanding General ISCOM as standard procedure for this area.

- (e) Planes shall not be taxed, either upon the taxiways or onto the airstrip in preparation for immediate take off, without first receiving permission by calling Eniwetok Tower. Planes shall

COPY

Annex I
(Page 4)

Taxiing Instructions (Cont'd)

take off only after receiving a green light or clearance to do so by voice radio from Eniwetok Tower.

- (f) Planes taxiing off the field after landing have the right-of-way over planes taxiing out for take-off. Planes in the taxi lane have the right-of-way over planes entering the taxi lanes. Planes landing have the right-of-way over taxiing planes and planes preparing to take-off.
- (g) Planes will not taxi along side the airstrip unless special permission is obtained from the Airfield Operations Officer.

5. NIGHT FLYING:

- (a) Clearance must be obtained from the Operations Officer.
- (b) Obstruction lights shall be on continuously from sunset to sunrise.
- (c) All taxiing at night will be done with the assistance of a "Follow-Me" Jeep.

6. RESTRICTED AREAS: Low flying over ships in the harbor or islands in the Eniwetok Atoll will not be permitted without proper authorization through Base Operations.

7. OBSTRUCTIONS:

- (a) Obstructions on Eniwetok Island are marked at night with red obstruction lights.
- (b) Obstructions on Eniwetok Island with height are as follows:

TOWER - Midway airstrip, lagoon side - 105'
ENIWETOK CONTROL TOWER - Midway airstrip, oceanside - 96'
AACS ANTENNAS - Midway airstrip, oceanside - 75'
ANTENNAS - North end of island - 100'
HARBOR CONTROL TOWER - Mid-island, lagoon side - 60'
ANTENNAS - Southwest end of island, lagoon side - 75'

8. AIRCRAFT SECURITY: Security of all parked aircraft will be as prescribed by Commanding Officer CIC Det.

9. VEHICLE AND PEDESTRIAN TRAFFIC:

- (a) Effective immediately, no vehicle other than those engaged in the direction of traffic or in the maintenance of the airfield shall be driven on the airstrip, or taxi strips.

COPY

ANNEX I
(Page 5)

Vehicle and Pedestrian Traffic (Cont'd)

- (b) No vehicle or pedestrian will cross the airstrip at any point.
- (c) The Operations Officer will enforce this order and violators will be subject to disciplinary action.

10. NAVIGATIONAL AIDS FOR ENIWETOK ATOLL:

See Appendix - C.

/s/ RAYMOND O. JACOBSEN

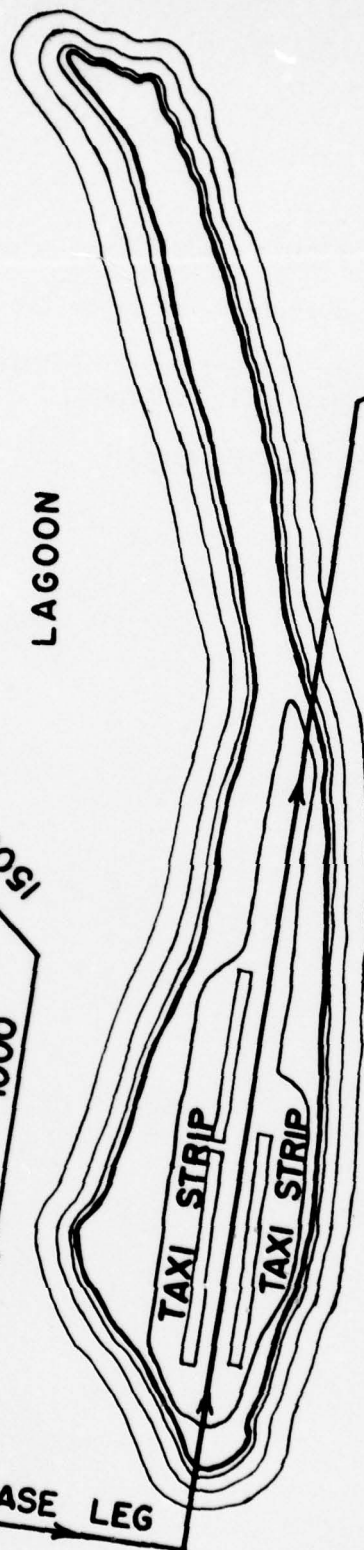
RAYMOND O. JACOBSEN
1st Lt, USAF
Commanding

COPY

ANNEX I
(Page 5)



LAGOON



MIN ALT
500 FT

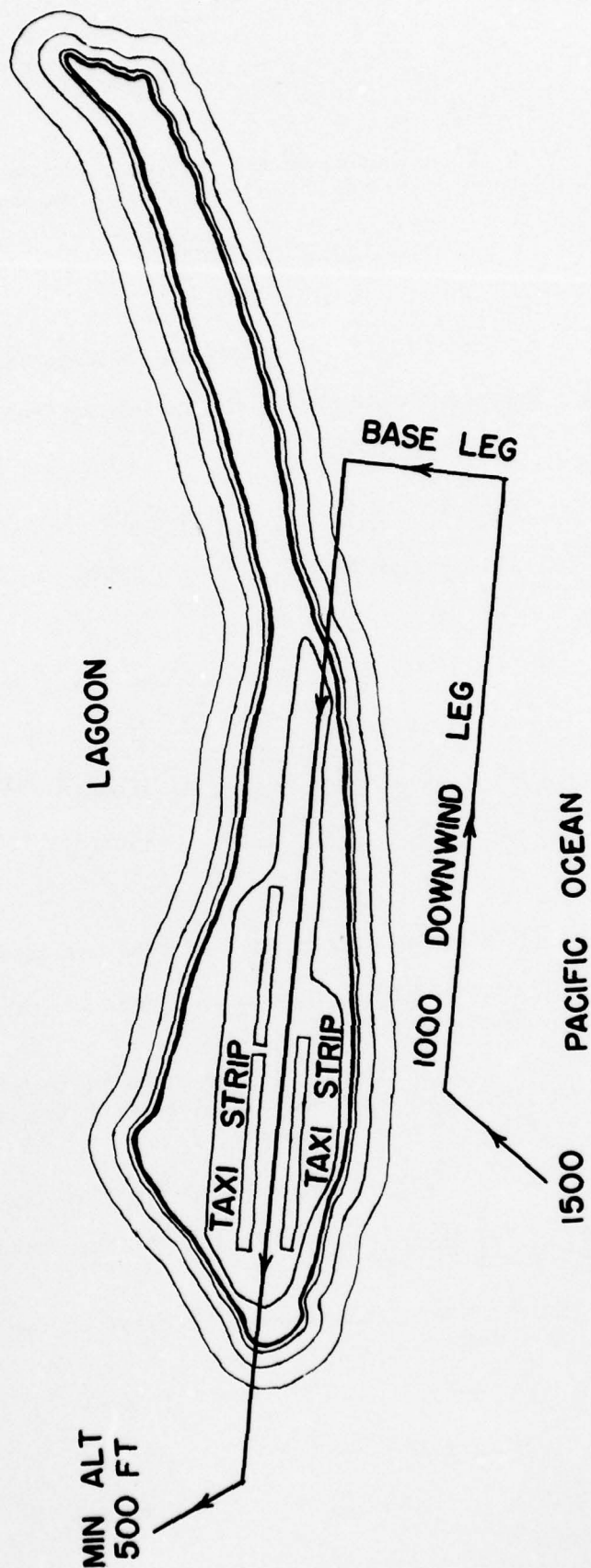
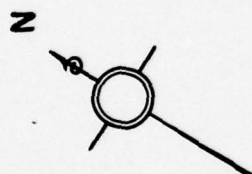
PACIFIC OCEAN

ENIWETOK ISLAND

TAKE OFF AND LANDING LAYOUT RUNWAY 6

APPENDIX A

APPENDIX B



ENIWETOK ISLAND

TAKE OFF AND LANDING LAYOUT RUNWAY 24

COPY

(Appendix "C"
to ANNEX I)

Appendix "C" of Airbase Reg 60-1 Eniwetok Air Base, APO 187 dtd 7 Jan 48, is hereby superseded and will be removed from the files:

APPENDIX "C"

Navigational aids for Eniwetok Atoll.

1. (a) Eniwetok Tower operates from 1900Z to 0500Z.

(b) Eniwetok Tower Guards the following frequencies:

- | | |
|---------------------|---------------|
| (1) 116.1 Mcs | (Channel "A") |
| (2) 126.18 Mcs | (Channel "B") |
| (3) 140.58 Mcs | (Channel "D") |
| (4) 4495 & 6970 Kcs | |

(c) Eniwetok Tower Transmits on the Following Frequencies:

- | | |
|----------------|---------------|
| (1) 116.1 Mcs | (Channel "A") |
| (2) 126.18 Mcs | (Channel "B") |
| (3) 140.58 Mcs | (Channel "D") |
| (4) 272 Kcs | |

2. Local JACSPAC Station has call of PM6A assigned to it.

3. JACSPAC Station (PM6A) Guards 4765 Kcs. (VOICE) and/or 6770 Kcs (VOICE) Continuously.

4. Homing beacon on Eniwetok Island operates on 345 Kcs, with an identification of GY. Homing beacon operates continuously. Station is 1.7 miles at 225° to field.

5. Night runway lighting available at Eniwetok Air Field upon request.

6. Engebi Airstrip: is closed to all traffic without approval of Eniwetok Base Operations.

(a) Engebi Tower Transmits and receives on the following frequencies upon request:

- | | |
|------------|---------------|
| (1) 116.1 | (Channel "A") |
| (2) 126.18 | (Channel "B") |
| (3) 140.58 | (Channel "D") |

COPY

(Appendix "C"
to ANNEX I)

COPY

(Appendix "C"
to ANNEX I)
(Page 2)

Navigational Aids for Eniwetok Atoll (Cont'd)

- (b) Magnetic Heading from Eniwetok ---- 338°
- (c) Distance from Eniwetok ----- 20 miles
- (d) Length of Runway ----- 3950 feet

COPY

(Appendix "C"
to ANNEX I)
(Page 2)

COPY

ANNEX II

HEADQUARTERS TASK GROUP 7.8
APO 187, c/o PM
San Francisco, California

25 April 1948

Revised
SCHEDULE OF ACTIVITIES FOR VIP OBSERVERS
(All times and dates local)

<u>DATE</u>		<u>ACTIVITY</u>
26 Apr (Mon)	1000	Arrive Kwajalein from Oahu
	1000-1200	Reception and briefing by CTG 7.4
	1330	Depart for Eniwetok (Circle Eniwetok Atoll)
	1600	Arrive Eniwetok (Detail will deliver baggage to your Quarters)
	1600-1730	Assignment to quarters swimming and recreation
	1730-1830	Briefing by CTG 7.2 (Officers Mess)
	1830-1915	Supper at Officers Mess
	1915-2015	Briefing by Dr. Clark, TG 7.1
	2030	Movies

27 Apr (Tues)	0715-0815	Breakfast at Officers Mess
	0830-1600	LCI trip to Aomon, Runit, Parry and return to Eniwetok. Inspection ashore of installations on Aomon, Runit and Parry Islands. (Transportation leaves Officers Mess at Eniwetok at 0830. Lunch aboard LCI)
	1600-1800	Swimming and recreation at Eniwetok
	1830	Dinner
	2000	Movies

28 Apr (Wed)	0715-0815	Breakfast at Officers Mess
	0830-1100	Transportation leaves Officers Mess Eniwetok for LCI trip to Engebi. <u>Personal baggage is to accompany, handled by a detail</u>
	1100-1215	Shore inspection of Engebi Island in DUKW's.
	1215-1330	Depart Engebi. Lunch aboard LCI enroute to Coral Reef Photo Tower and Ships Anchorage.
	1800	Supper aboard ship.

29 Apr (Thurs)	0900-1200	Briefings aboard Mt. McKinley. (Small boat transportation will leave Bairoko, Curtiss and Albemarle at 0830)

30 Apr (Fri)	0900-1200	Briefings aboard Mt. McKinley. (Small boat transportation will leave Bairoko, Curtiss and Albemarle at 0830)

1 May (Sat)	0900-1030	Briefings aboard Mt. McKinley. (Small boat transportation will leave Bairoko, Curtiss and Albemarle at 0830)

ANNEX II

COPY

ANNEX II
(Page 2)

Revised Schedule of Activities for VIP Observers - (Cont'd)

<u>DATE</u>		<u>ACTIVITY</u>
1 May	1030-1200	Tour of inspection of Albemarle.
(Sat)	1330-1600	LCI tour of Aomon Island and to Eniwetok. (Small boats leave shipside for LCI at 1330. <u>Personal Baggage to accompany with detail assisting.</u>)
(Cont'd)	1600	Arrive at Eniwetok and assignment to quarters.
	1630-1800	Recreation at Eniwetok
	2000	Movies

2 May	0700-0800	Breakfast at Officers Mess
(Sun)	0800-0930	C-47 tours of Aomon
	0930-1300	Fishing trips, shell hunting expeditions, swimming and recreation at Eniwetok (Tentative).
	1300	Lunch at Officers Mess
	1400	Baggage taken to Airport by Detail
	1430	Transportation leaves officers mess for airport
	1500	Depart Eniwetok for Kwajalein
	1730	Arrive Kwajalein
	2000	Military invitees depart for Oahu

3 May	0700	AEC invitees depart Kwajalein for Oahu
(Mon)		

ANNEX II
(Page 2)

ARMY TASK GROUP (7.2)
APO 187, % Postmaster
San Francisco, Calif.

26 April 1948

NOTES TO ACCOMPANY SCHEDULES OF ACTIVITIES FOR OBSERVERS

Please permit us to welcome you to Eniwetok Atoll. Every endeavor has and will be made to make your visit pleasant and memorable. To this end certain information is submitted below.

Cover Fee. In order to cover the cost of your seven meals scheduled at Eniwetok between now and your departure, orderlies and baggage handling service and for beverage components and the attendants therefor, available at the Officers Mess during your stay, a fee of \$6.00 is payable upon registration. Warrant Officer Black (phone 115) as Billeting Officer, will supervise collection.

Swimming at Beach Club. 1630-1730 26 April (Initially)

Dress in your quarters where you may have a fresh water shower on return. Motor transportation will call for you on request: Call 236. Swimming trunks are generally worn but are not required. Your BVD's will do in a pinch. There are no ladies present on the island. The club includes dressing rooms and shower but they will be crowded.

The beach club also serves cold drinks. Swimmers are wise to carry a few coins of change if they think they may become thirsty. Bottled goods are also available for purchase and the club will hold your bottle in its locker if you wish. (It can also be locked up for you at the Officers Mess). The Beach Club opens at 1100 hours and is open nightly until 2300 hours. (2400 hours on Saturday).

Reception 1730 26 April. Prior to the briefing before supper this evening, 26 April, at the Officers Mess, the Island Commander invites you to refreshments.

Movies. The Open Air Theater is 100 yards to the south of the Officers Mess and a show will be given to suit your schedule each of the three nights you are to stay on Eniwetok. Seats are provided for you in the raised, covered platforms.

Post Office and Post Exchange. This building is the second one south of the Theater. Hours for the Post Office are 0800-1600 (closed Sundays) and 1200-2000 for the Post Exchange.

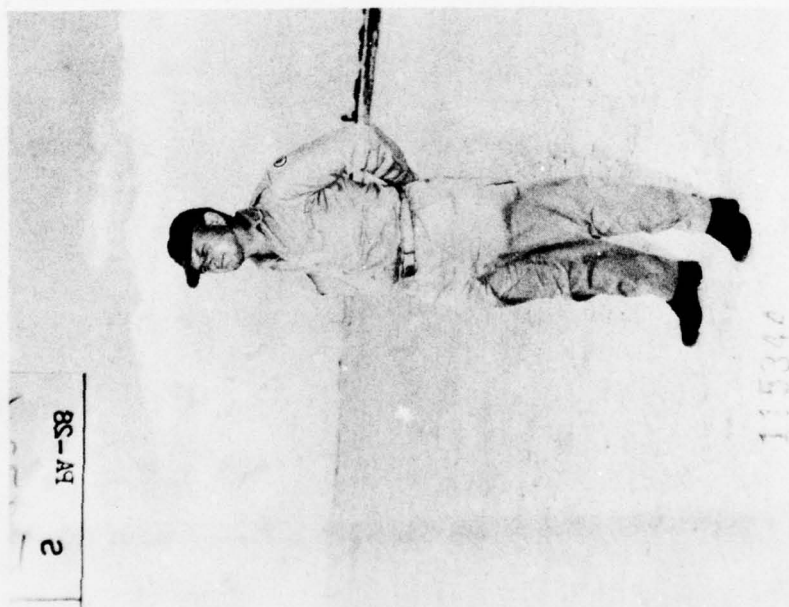
Inspection of Island Installations. If you are interested in inspecting any features of the installations on Eniwetok, please contact Lt Col J. E. Harper, Jr. (Office phone 105, Quarters phone 206), who will make necessary arrangements.

Notes to Accompany Schedules of Activities for Observers - 4/26/48 - Cont'd.

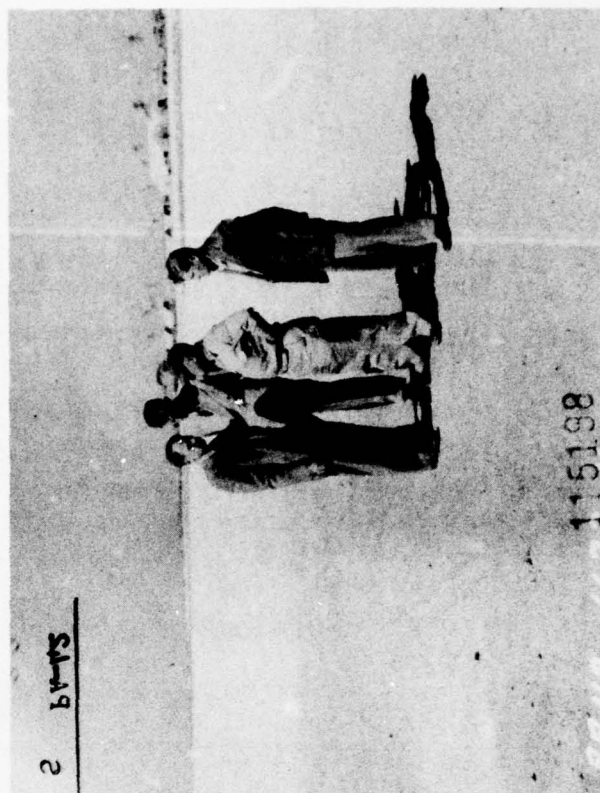
Attendants at Officers Mess. After supper this evening and on Tuesday and Saturday evenings an attendant will be at your service at the Officers Mess to mix drinks from any bottled goods you care to supply. Bottled goods at reasonable prices may be obtained from Capt Jung, Headquarters Commandant, Quarters phone 115 or the TG 7.2 A.D.C., Lt Suchomel, Quarters phone 240. Inquiries may also be made of the attendants at the Beach Club. Components and service will be available at the Beach Club during all its open hours and at the Mess before and after the evening meal.

Handling of Baggage. Every effort will be made to handle your baggage efficiently. Please do not remove tags. Prompt notice of loss of any article will be appreciated. Details to take your baggage from the plane to your quarters from your quarters to the LCI and thence aboard quarters on your ship Wednesday 28 April (and return of baggage from ship to Eniwetok on 1 May), and, finally, transporting your baggage to airport and loading it aboard plane on 2 May, will be handled for you. Please have baggage ready to be picked up prior to departure schedules.

Transportation. Cars will be arranged for all scheduled events. For further transportation such as taking you to Beach Club, telephone 236 as indicated above.



Brig. Gen. D. A. D. Ogden, Island
Commander, Eniwetok Atoll, during
Operation Sandstone.



Left to Right: Dr. Clark, Dr. Carlson, Gen. Ogden,
and Mr. Jercinovic at Eniwetok, January, 1948.

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JOINT TASK FORCE SEVEN WASHINGTON DC
OPERATION SANDSTONE. NUCLEAR EXPLOSIONS. SCIENTIFIC DIRECTOR'S --ETC(U)
1948

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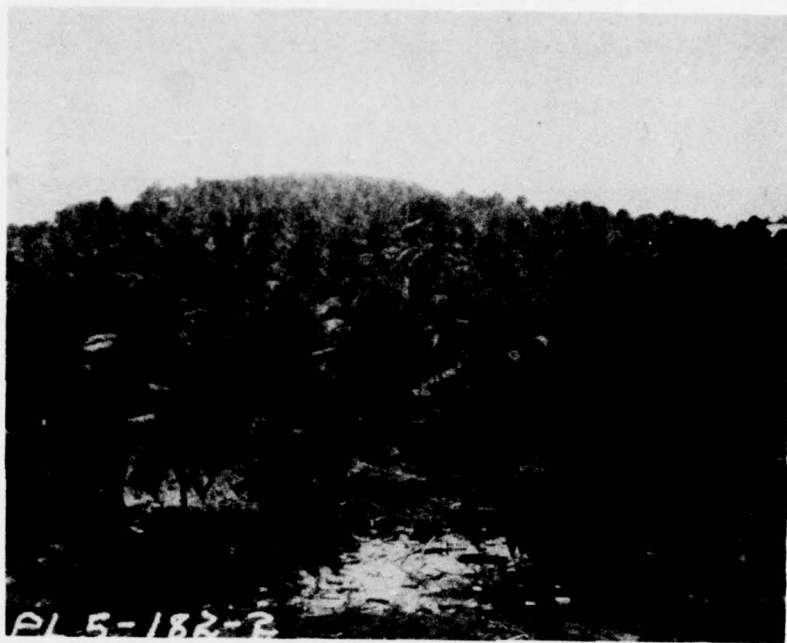
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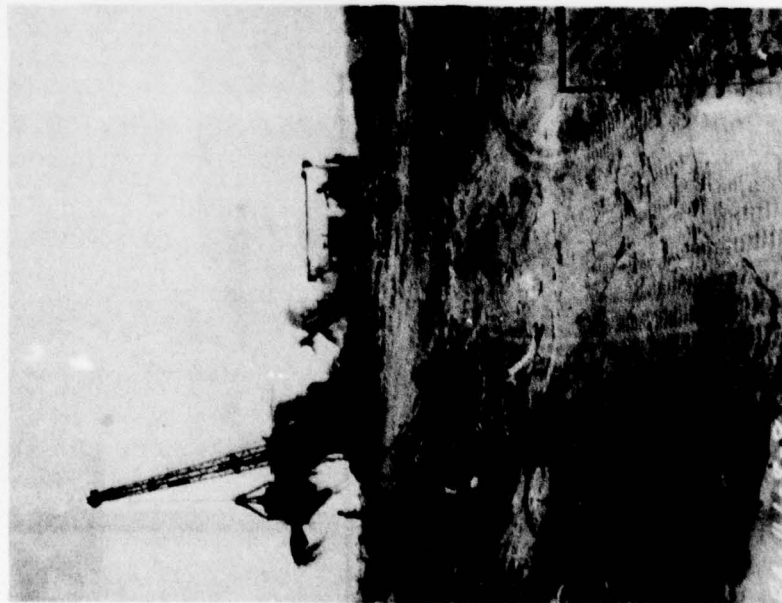
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Runit Island 19 December 1947, viewed from the zero point, looking south.



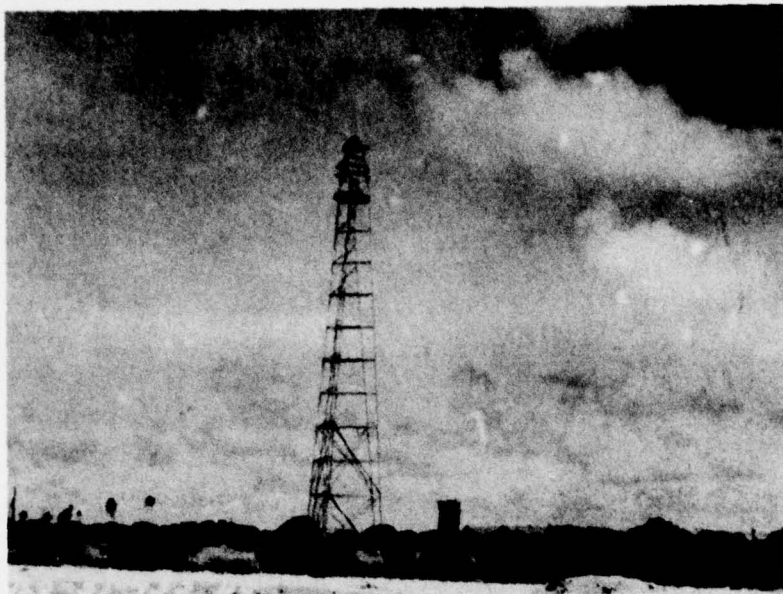
Runit Island 28 January 1948, viewed from the zero tower, looking south.



D-8 Bulldozer knocking down palm trees, and crane loading them on trucks, Aomori, 21 January 1948.



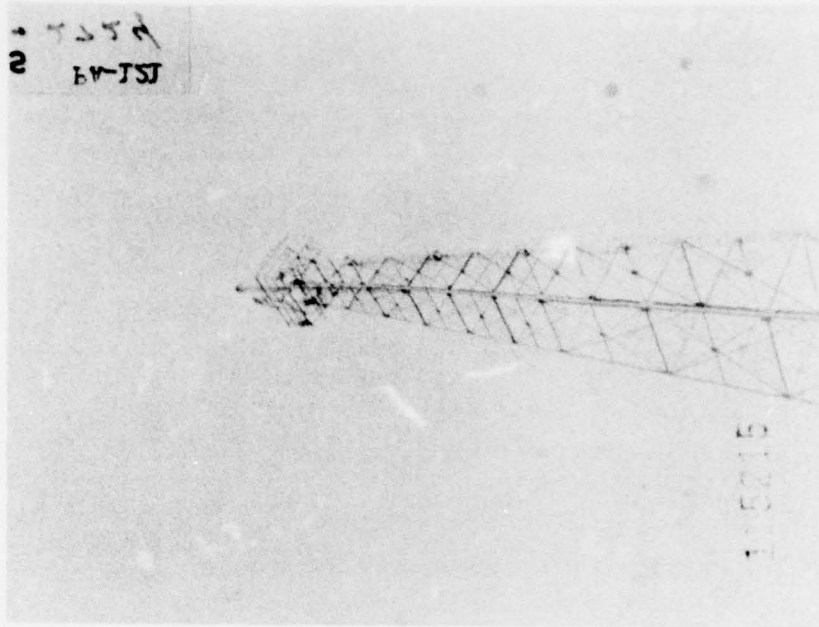
D-8 Caterpillar Tractor knocking down palm trees on Runit Island, 19 December 1947.



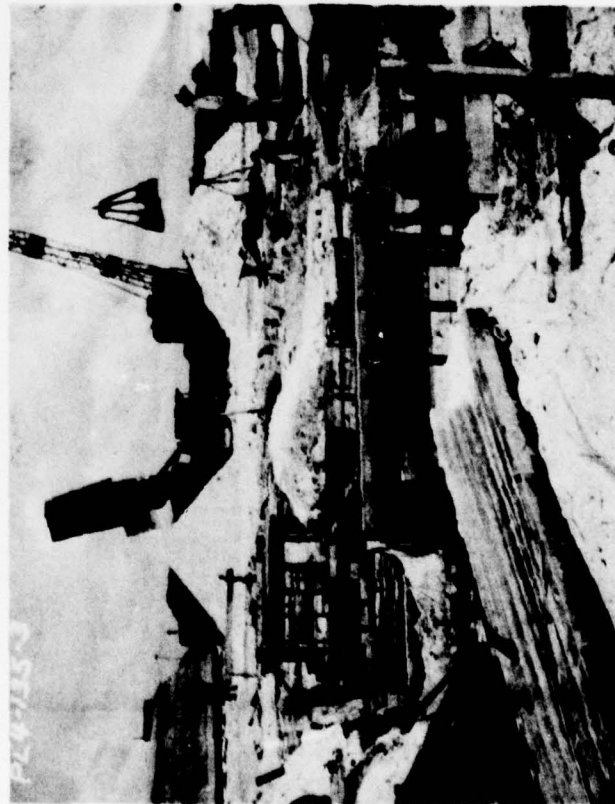
75 ft. Bilby Tower erected by the Survey Crew on Engebi. These temporary towers were used in the Atoll Triangulation.



During the last week in January 1948, 25 - 40 mph winds made it necessary to use a windbreak in the survey operations. Lt. Cmdr. Pfau (foreground) and the survey crew on Runit Island.



Assembly operations on 200 ft.
steel tower, Engebi Island.



Mr. Kelly (MK-PK foreman), (in sun helmet)
directing cement-pouring operations for the
200 ft. steel tower footings, Engebi Island.



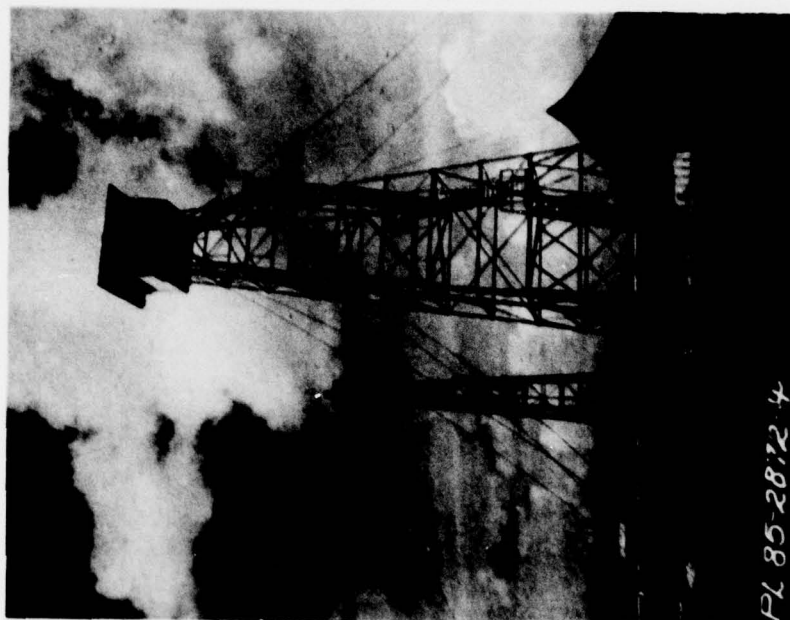
Coral Rock Crushing Operations on Engebi, 20 January 1948. The crushed coral was used for making the concrete used for instrument buildings



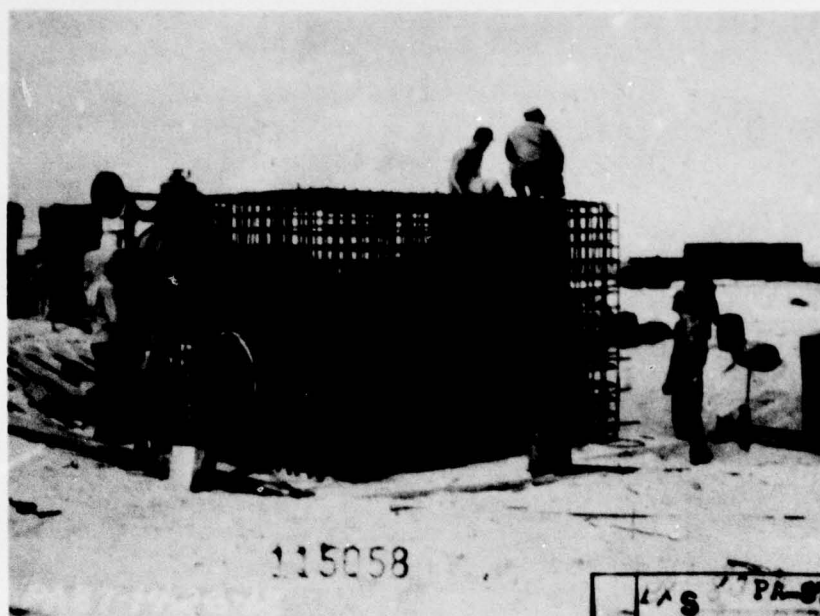
Asphalt storage and loading incline on Engebi, 25 February 1948. 7000 barrels of asphalt were used for soil stabilization.



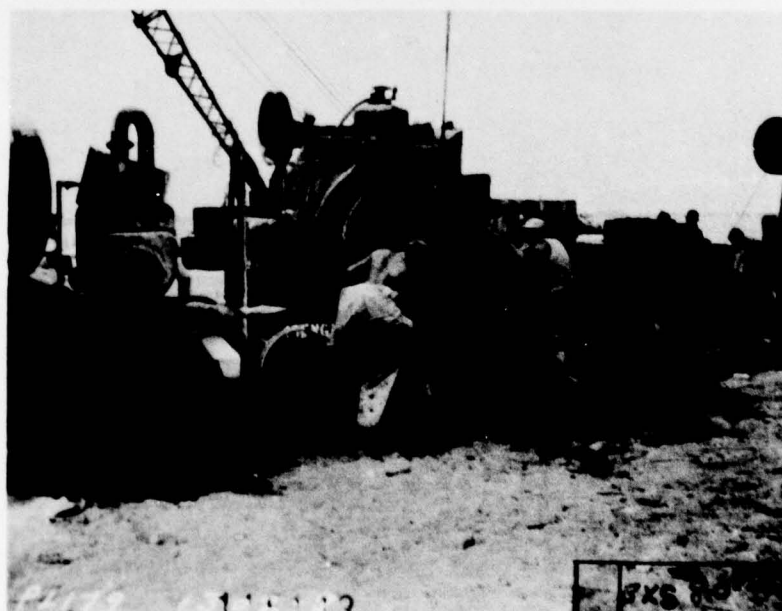
Left to Right: Gen. Worsham, Col. Barnes, Mr. Kiewitt, Mr. LaMarr, Mr. Bonny, Mr. Lovitt, and Gen. Ogden arrive at Eniwetok for tower inspection trip, 11 February 1948. The civilians represent MK and PK Contractors.



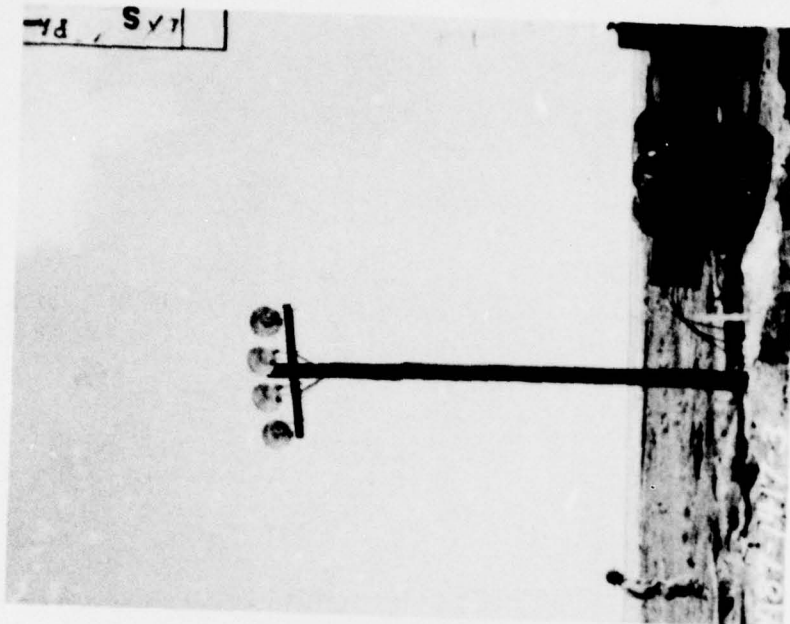
75 ft. Camera Tower and Photo Generator Shack in foreground, and 200 ft. tower in background. Acomon, 30 March 1948.



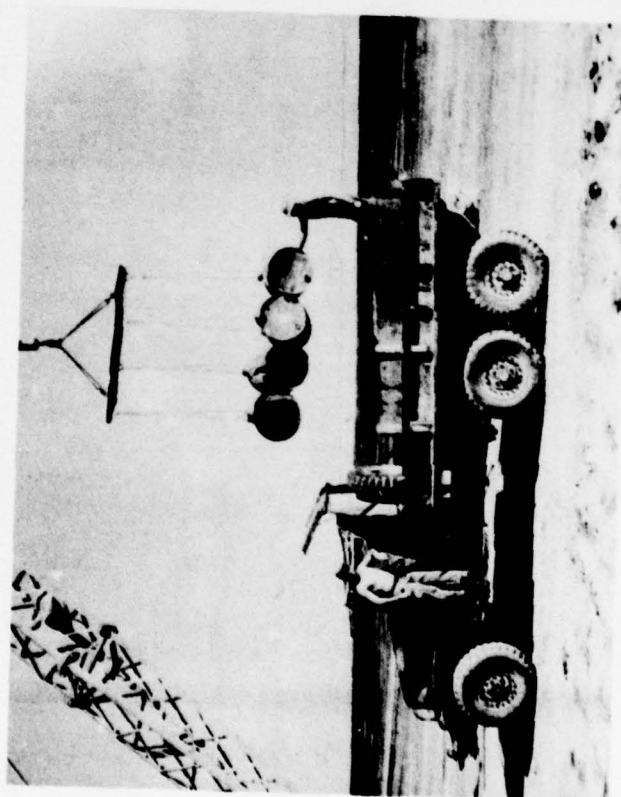
Steel reinforcing for Gamma Station "B".



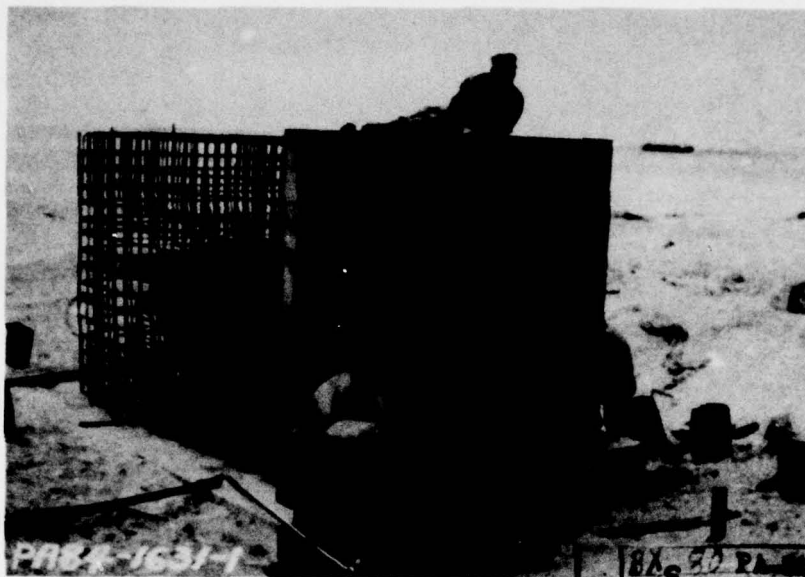
Making special Limonite-steel-cement aggregate used in the Gamma Stations, Engebi Island.



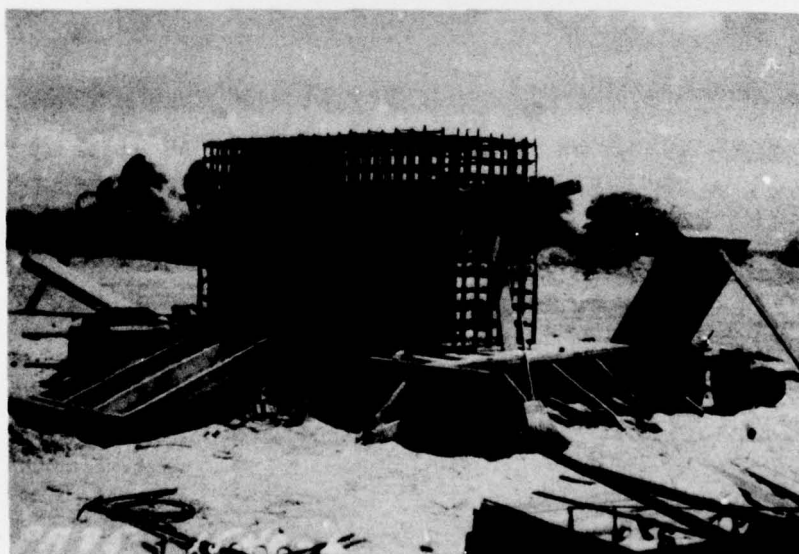
One of the floodlight installations near the zero tower, Runit Island. The floodlights were used for security purposes.



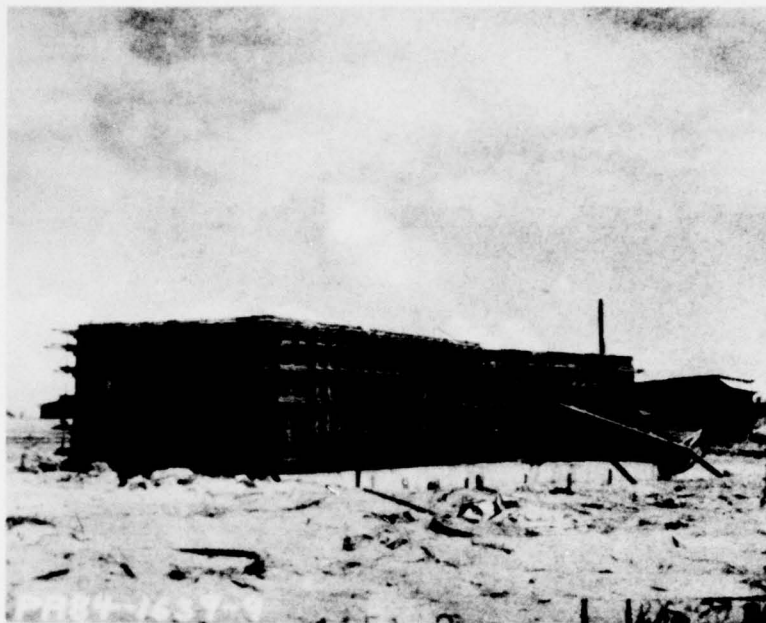
Method of handling barrels of asphalt, Engebi.



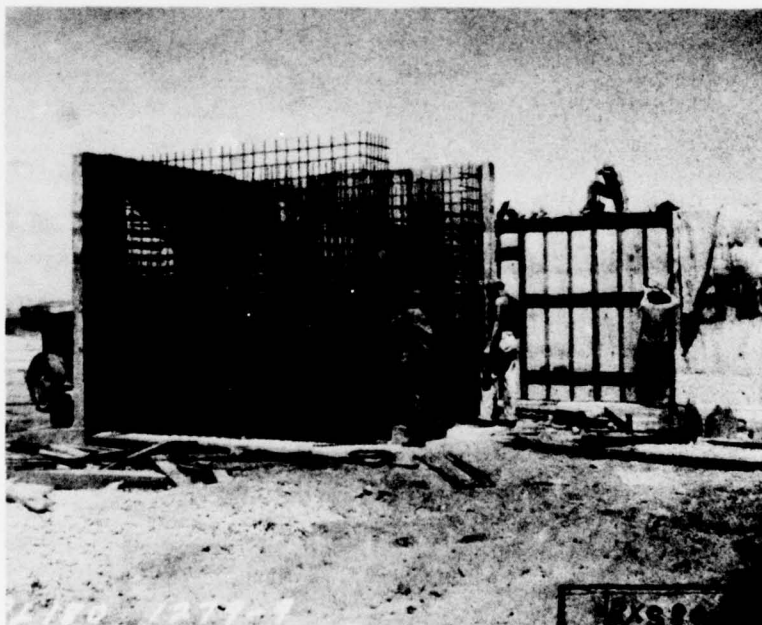
Engineer Troops assembling steel reinforcing and wooden forms for Gamma Station "A", Runit Island.



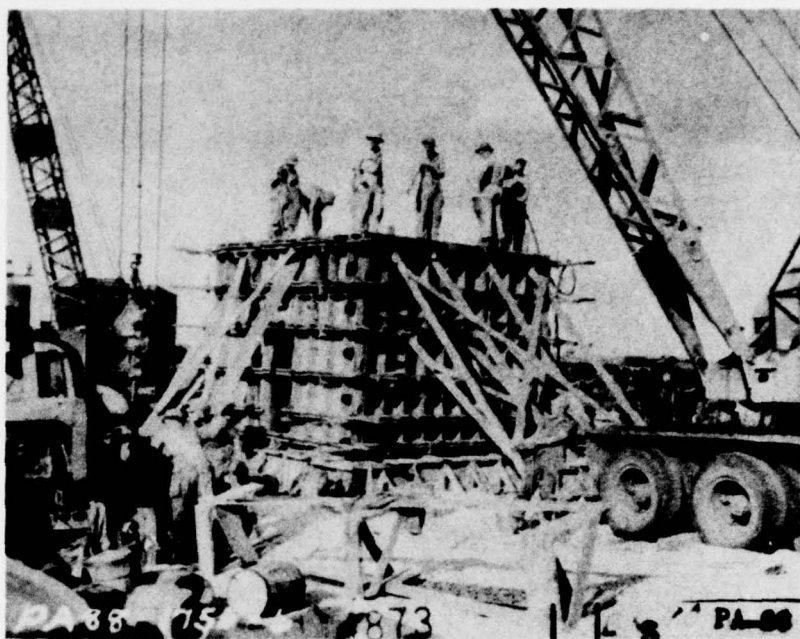
Steel reinforcing for Gamma Station "C", Rojua Island.



Front and side view of Timing Station formed up, Biijiri Island, 27 February 1948. The generator shack is at the right.



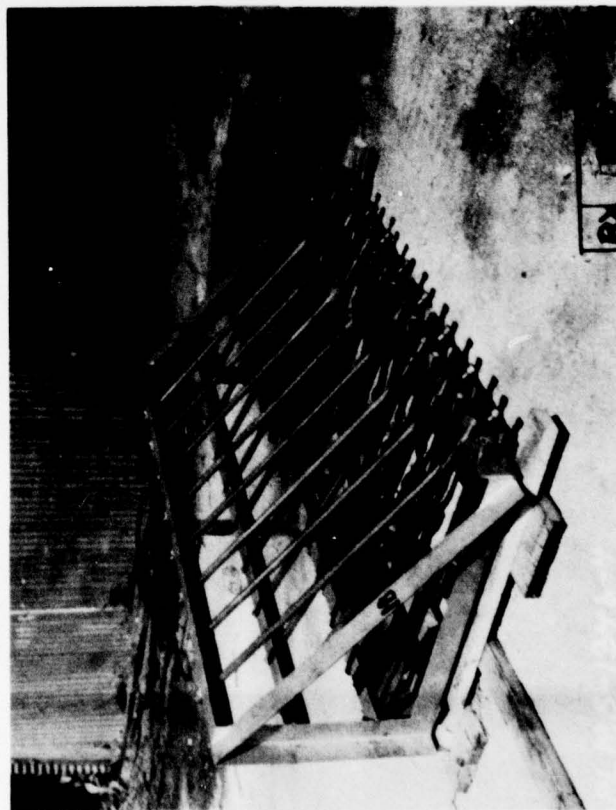
Steel reinforcing being erected for Gamma B Building, with the Timing Station in background. 11 February 1948, Engeb1.



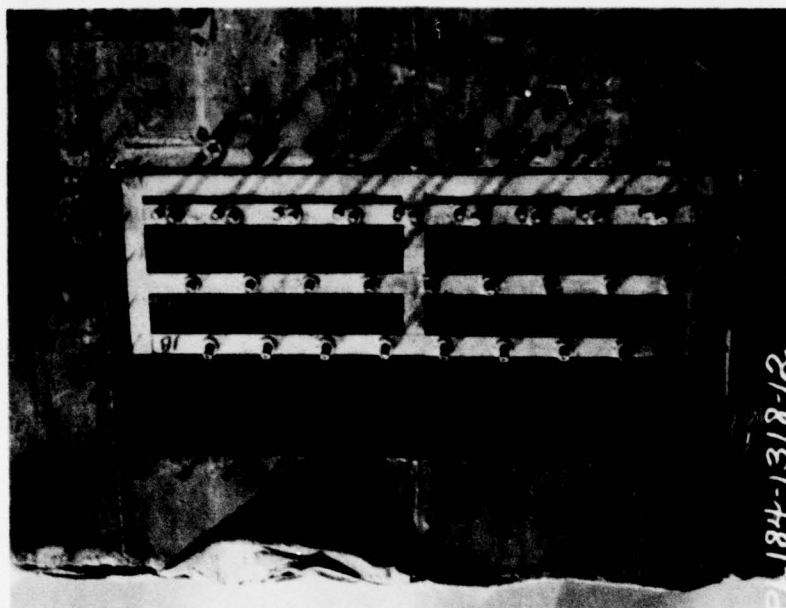
Pouring special Limonite-steel-cement aggregate for the Gamma Station "B", Runit Island.



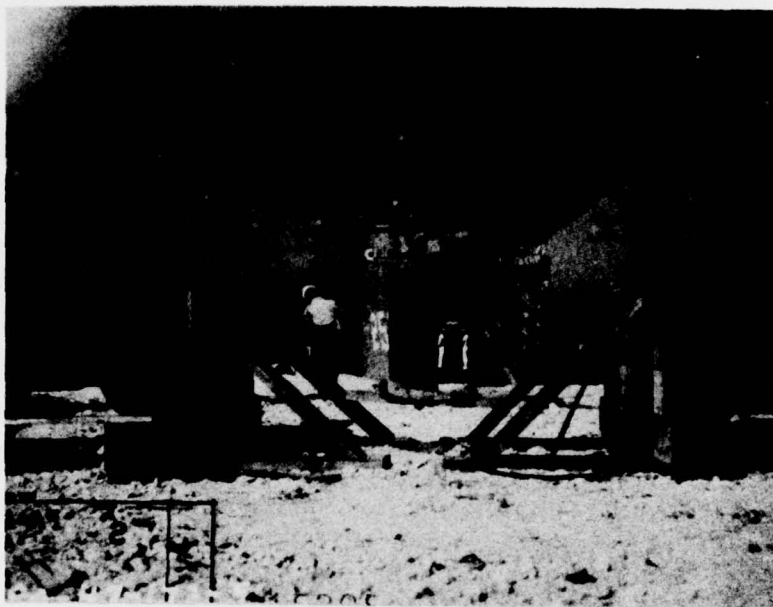
Dr. Carlson (left) directing the pouring of special Limonite-steel-cement aggregate around the aperture assembly in Gamma Station "B", Runit Island. Capt. Waits (fourth from left) was Resident Engineer on Runit.



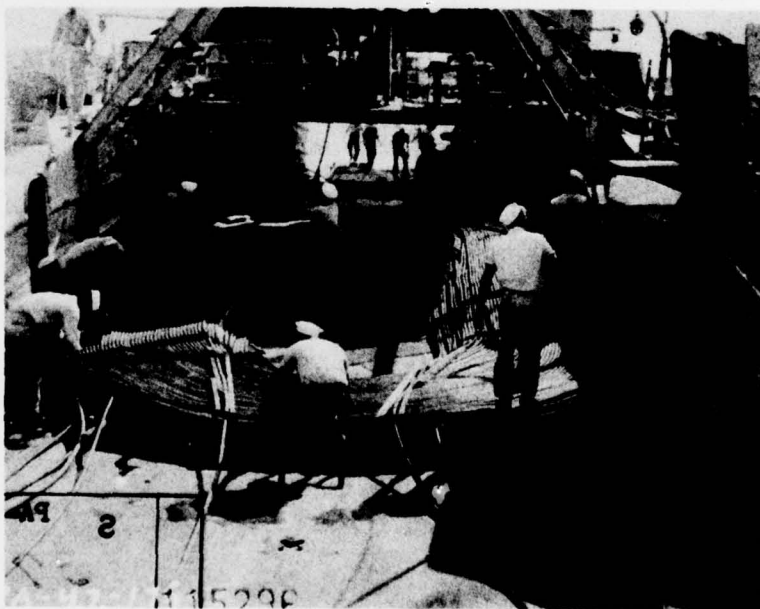
Steel rack assembly of collimating tubes used in Gamma Station "B", Engebi Island



Steel rack assembly of collimating tubes in place in the Gamma Station "B" before special aggregate was poured.



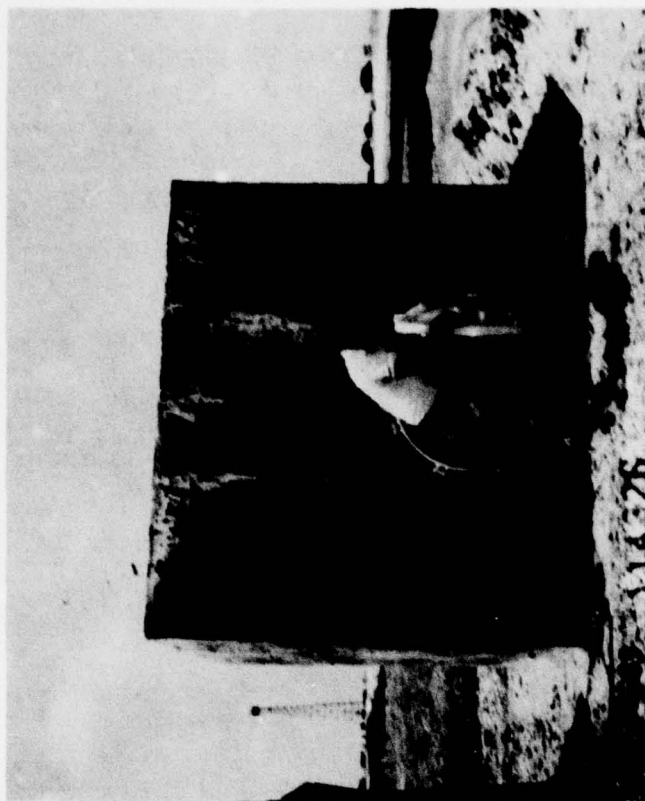
10-Conductor Submarine Cable being loaded aboard converted LSM used in cable-laying operation, Parry Island, 27 January 1948.



10-Conductor Submarine Cable being coiled on deck of LSM. Parry Island, 27 January 1948.



EM/2c Smith and F/lc Kane splicing
10-Conductor Submarine Cable on
deck of LSM, 27 January 1948.



Rear view of Gamma "A" Shelter, 750 yds.
from zero tower, Engebi, 23 March 1948.



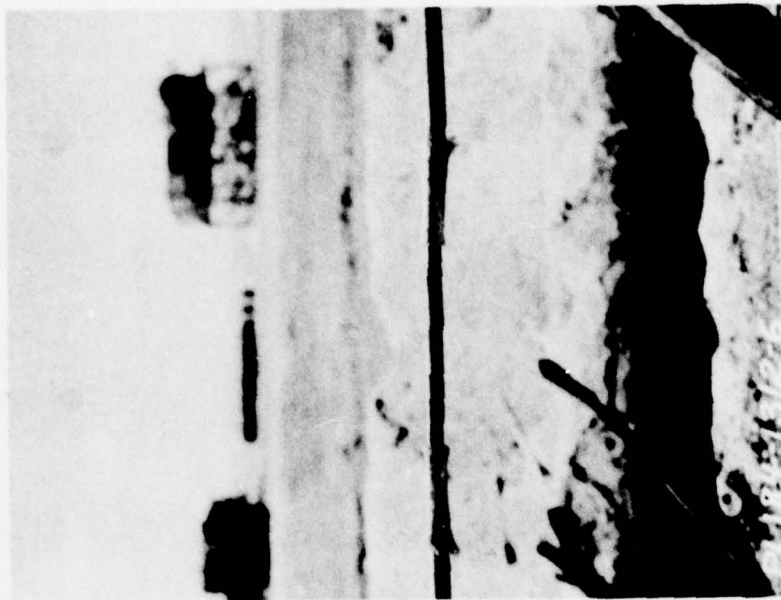
Concrete mixers, water trucks and Engineer Troops pouring concrete for blast building base, Engebi, 20 January 1948.



Tank revetments on Engebi, with tank and controlling helicopter during testing operations. 29 March 1948.



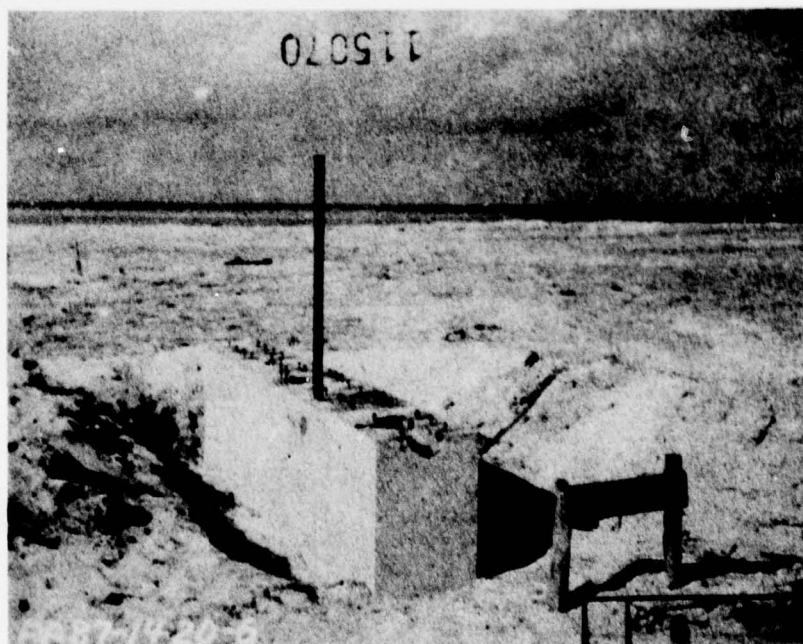
Applying K 5-40 cement to RG-18/U
coax line during splicing operation,
Engel, 26 February 1948.



After applying Polyethylene Tape to RG-18/U
during splicing operation, Engel, 26 February
1948.



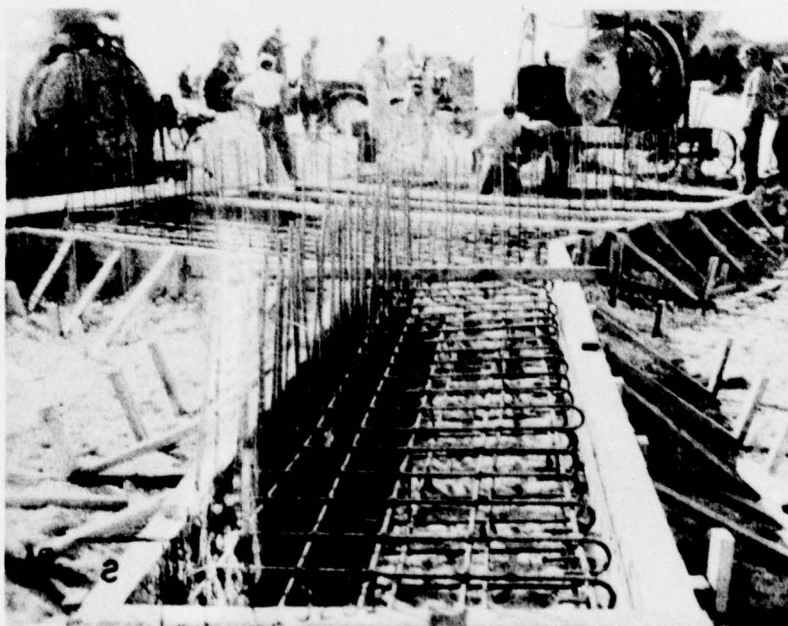
Engineer Troops erecting blast footing form, Biijiri, 27 February 1948.



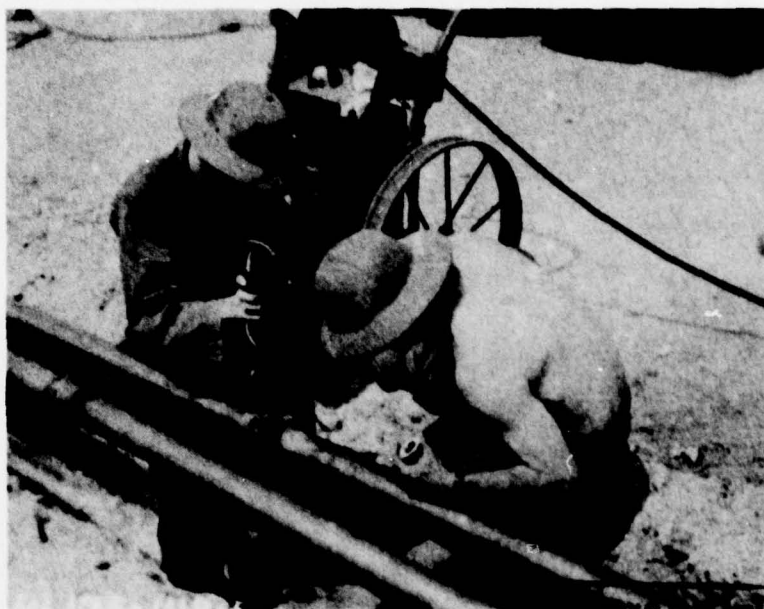
Finished type A blast footing, ready for instruments, Aomon, 27 February 1948.



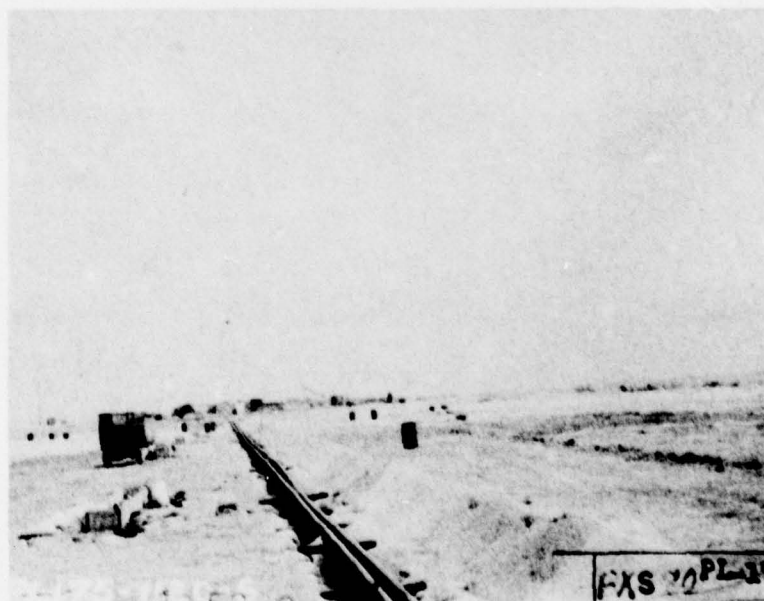
Sgt. Ambrose assembling lead coffin in Timing Station, Engebi Island.



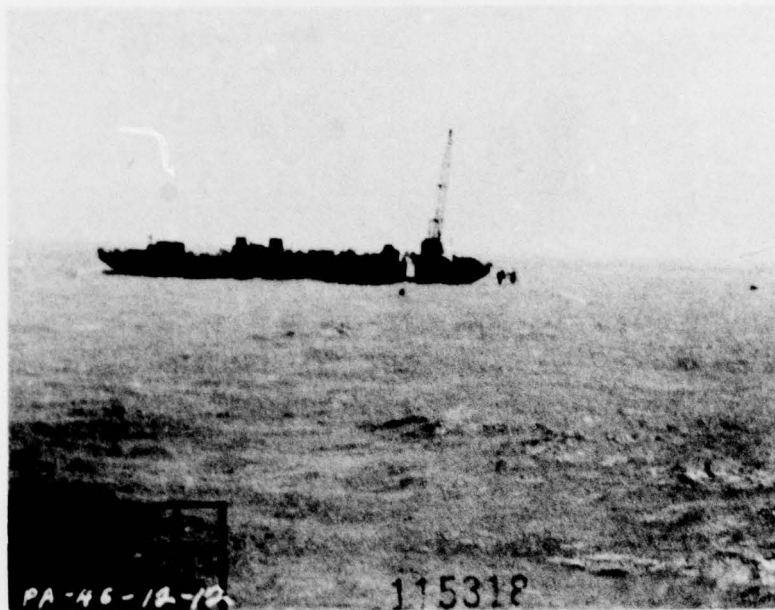
Concrete pouring operation for footing of Blast Building, Engebi Island.



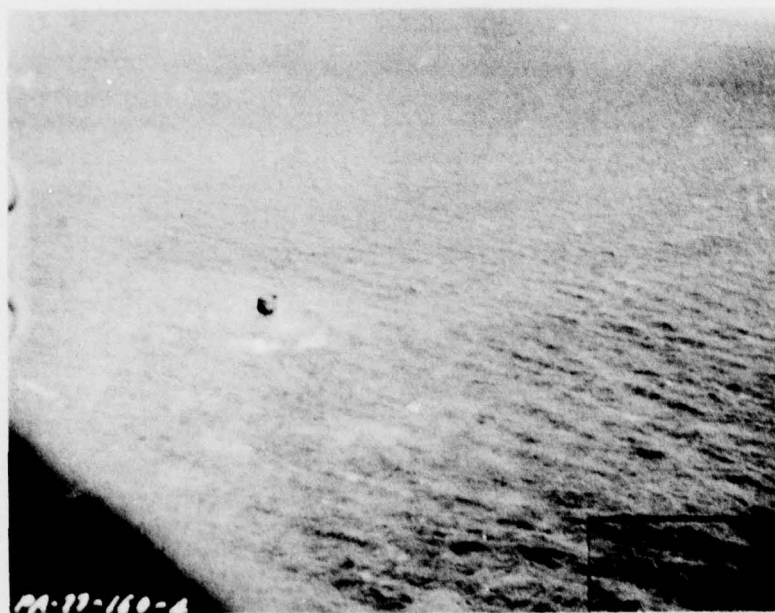
Captain Pavic and M/Sgt. Reynolds (AFSWP) soldering joint in 3" coax line, Engeb1.



General view of two 3" coax lines extending from zero tower to timing station, before lines were lowered into ditch, Engeb1. The temporary Bilby tower in background was for survey purposes and was removed before X-Day.



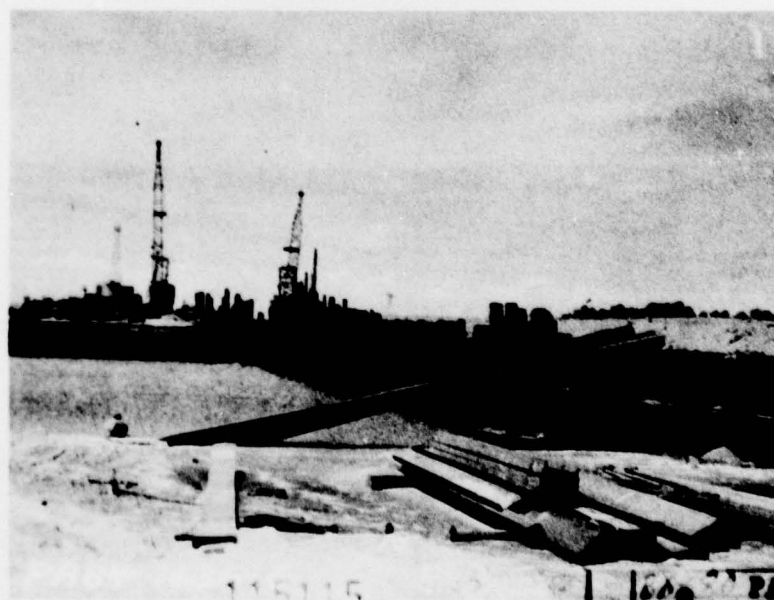
Barge with pile driving crane erecting coral head (75 ft.) photo tower,
21 January 1948.



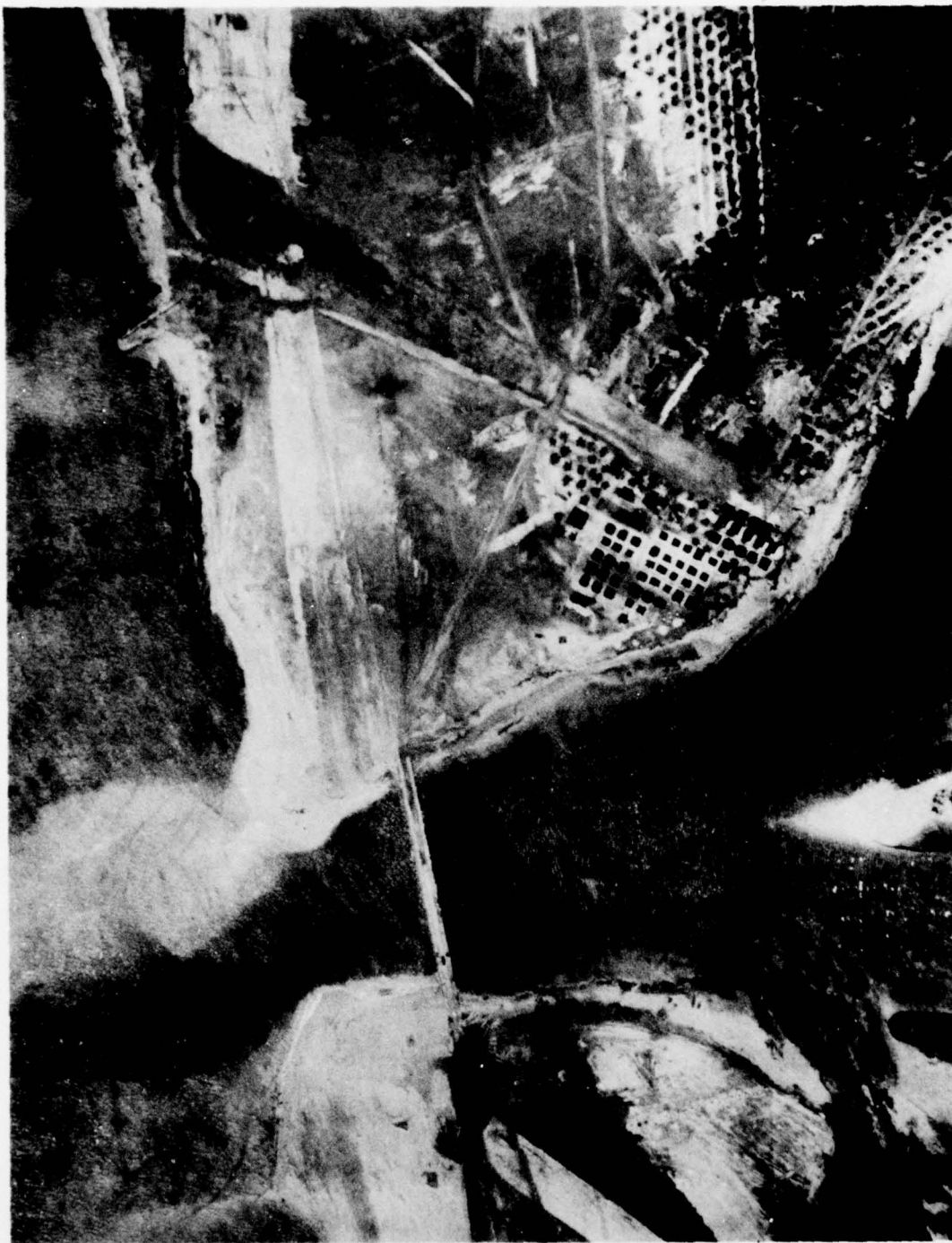
Aerial view of steel-sheet piling pier in lagoon used as Bilby tower
footing, during inter-island triangulation survey, 2 February 1948.



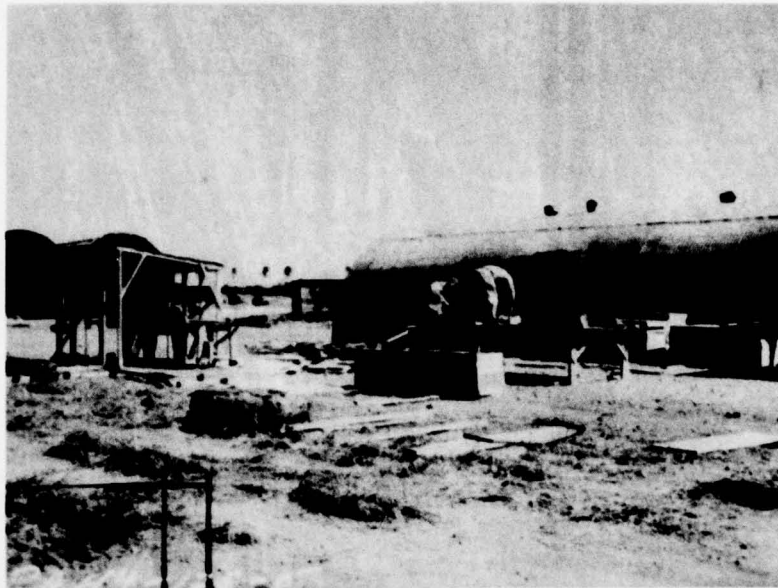
A causeway 30 ft. wide and about 900 ft. long was built in the water gap between Aomon and Biijiri. Aomon is in the foreground, Biijiri middle left, and Rojoa at top left of picture. Maximum depth of water in gap was 15 ft. 27 February 1948.



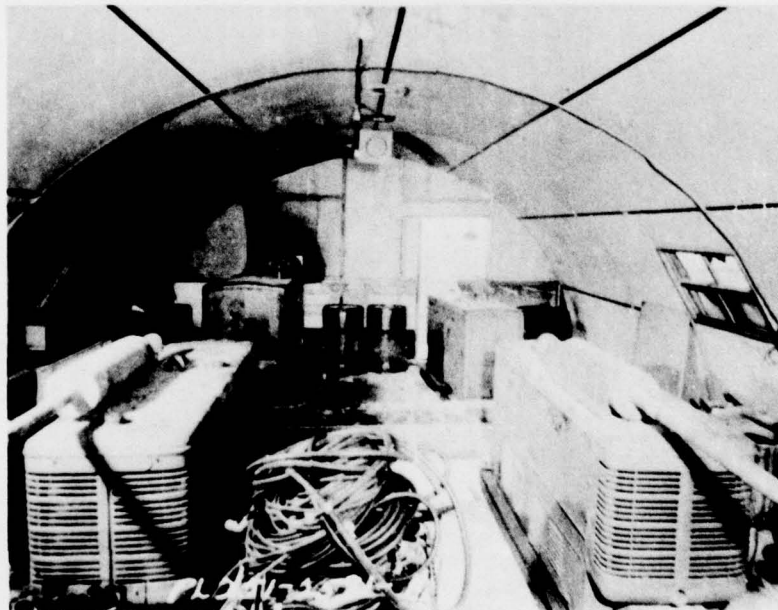
View of south end of causeway between Aomon and Biijiri, built by driving steel-sheet piling into the coral and filling in with coral sand and gravel. 27 February 1948.



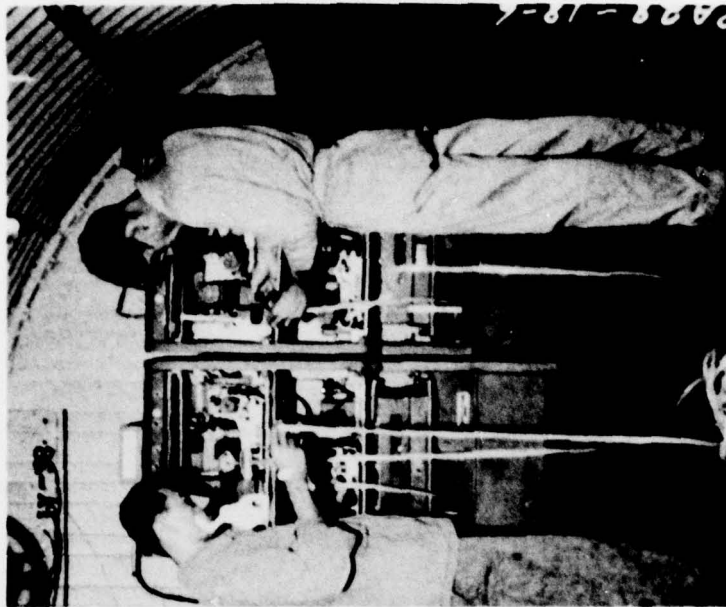
Aerial photograph of Aomon (top) - Bijiri (bottom), showing the 30 ft.-wide causeway built to connect the two islands. Originally both islands were covered with palm trees, and the amount of "clearing" required can be seen. The airstrips for L-5 planes are on both islands, extending approximately 45° with the direction of the causeway. The tent camp used by the Engineer troops is seen on Aomon (black squares).



Carpenter shop at Engebi, 19 January 1948. This carpenter shop made forms for all concrete structures on Engebi, Aomon-Biljiri and Runit.



Interior view of generator shack at timing station on Engebi, showing two utility and two instrument generators.



Some of the automatic equipment at
Eniwetok Communication Center.



Tank revetment made by welding together
salvage 6" steel pipe, Runit Island.



Spreading cement in the soil stabilization operations, Aomon-Biijiri.



Watering and rolling the cement-coral sand mix in the soil stabilization operations, Aomon-Biijiri.



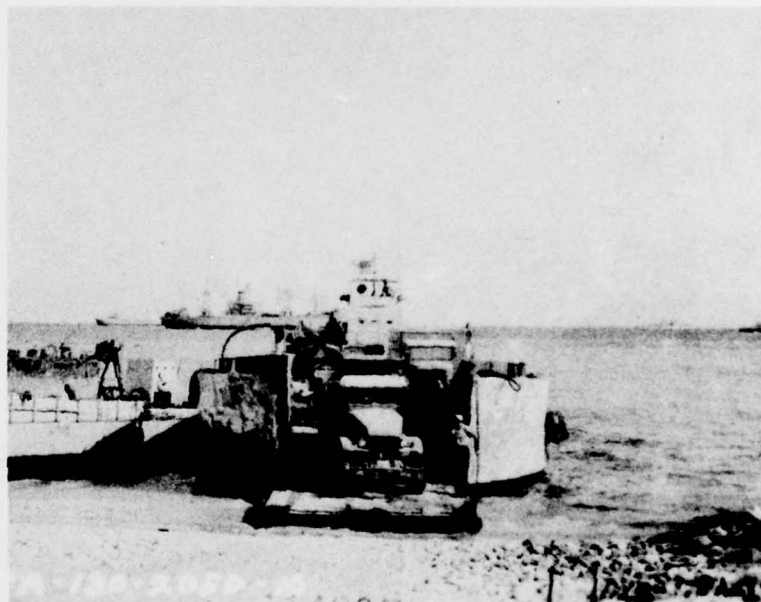
L-5 planes and pilots on the Eniwetok Airstrip.



Laundry facilities on Eniwetok Island. This laundry was operated by the Engineer Troops.



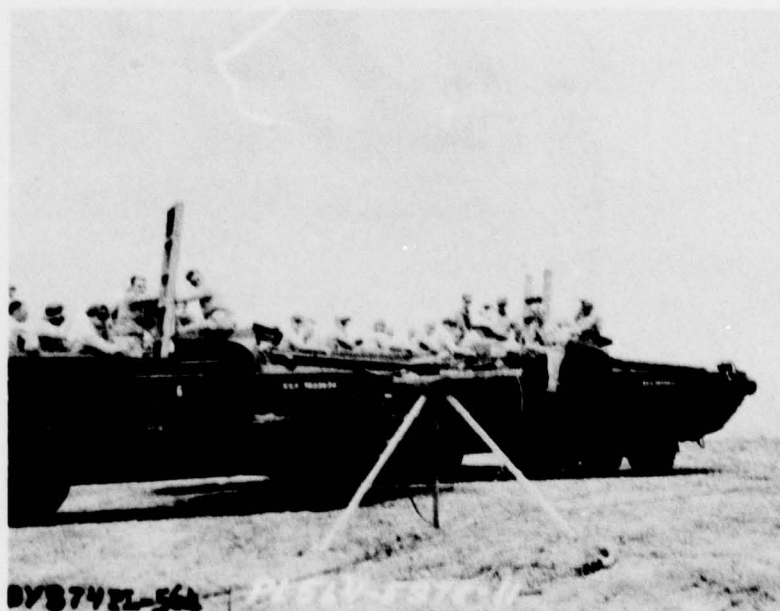
Fissionable materials storage vault in barbed wire enclosure, built on Eniwetok.



Truck boarding LCT at Eniwetok. LCT's and LCM's were used for inter-island cargo ferry service.



The invited visitors (VIP's) for Operation Sandstone were given conducted tours throughout the atoll, traveling between islands via LCI, and making island tours by means of DUKW, as shown in above photograph.



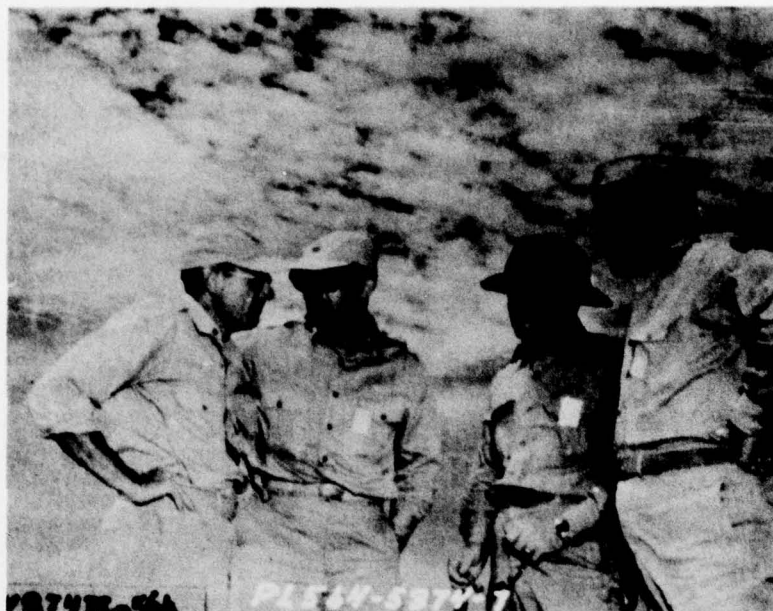
VIP's examining a typical neutron measurement station.



Dr. Clark discussing the instrumentation involved in the tests with
VIP's, Biijiri Island.



VIP's examining the drone tank, Biijiri Island.



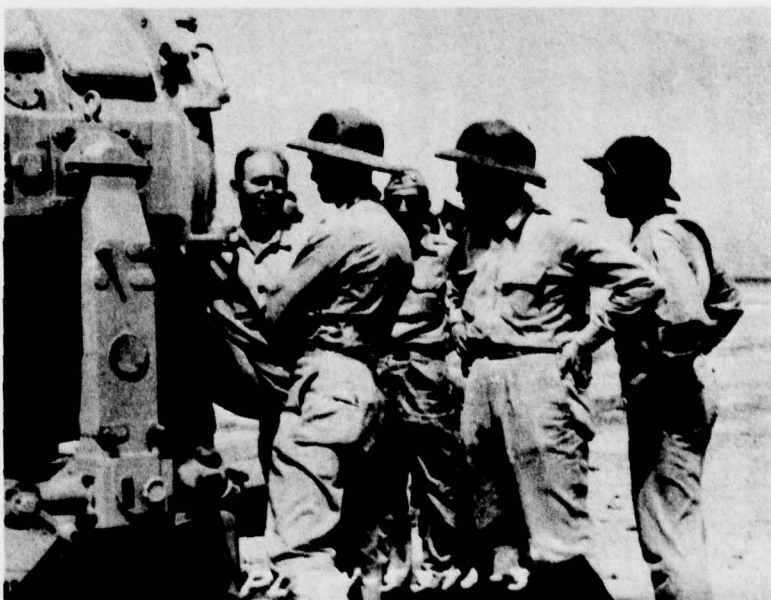
Left to Right: Dr. Clark, Lt. Col. Crumley, Maj. Gen. Craigie, and Maj. Gen. Decker, in discussion during the VIP tours.



A group of VIP's at the Timing Station. This photograph also shows the lead castings (on the roller track) used in the lead coffin.



Dr. Shonka (in T-shirt) discussing gamma-ray measurements with a group of VIP's.



Dr. Edgerton (left) discussing the Teller-alpha measurement with a group of VIP's.

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A group of VIP's examining one of the Blast Stations.



Dr. Clark discussing blast measurement apparatus with a group of VIP's.

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